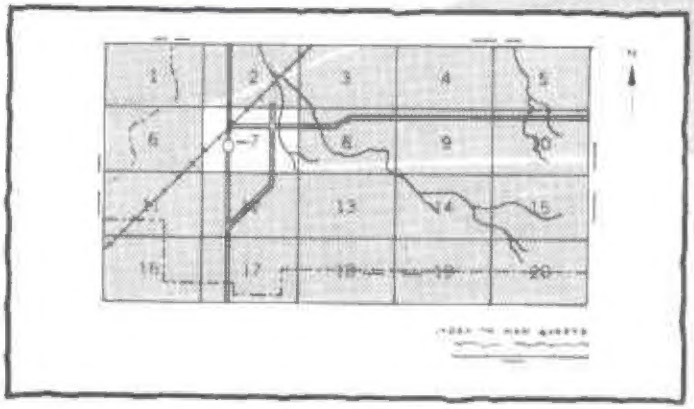
Soil Survey of

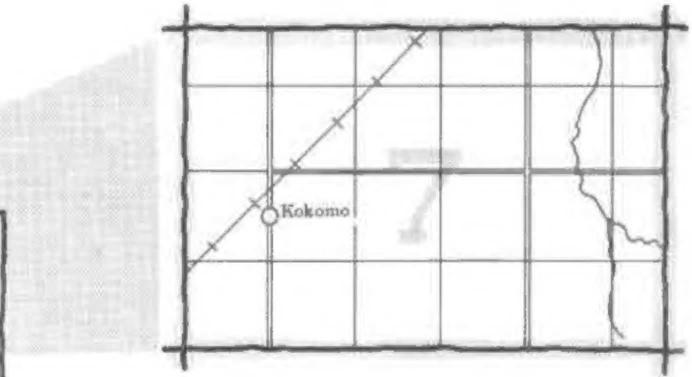
Clinton County, Indiana

United States Department of Agriculture, Soil Conservation Service
In cooperation with
Indiana Department of Natural Resources, Soil and Water Conservation Committee
and Purdue University, Agricultural Experiment Station

HOW TO USE

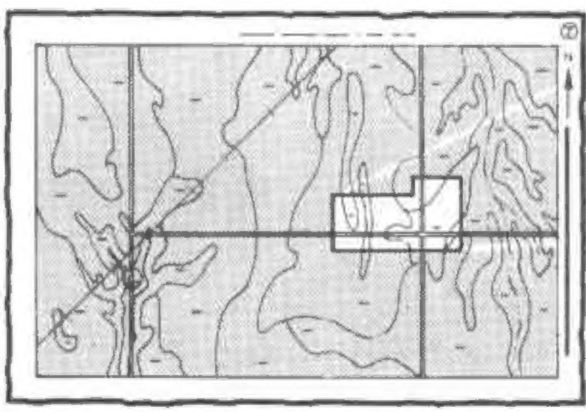
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

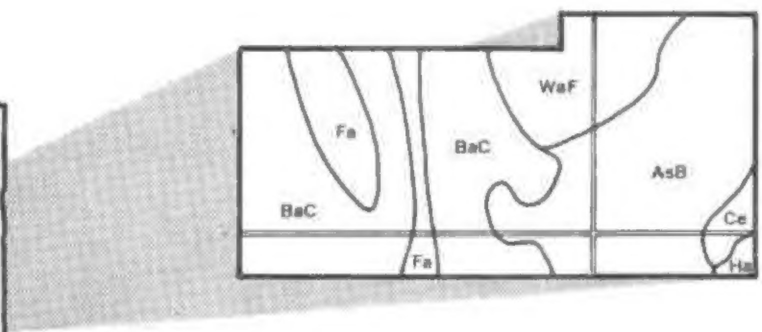




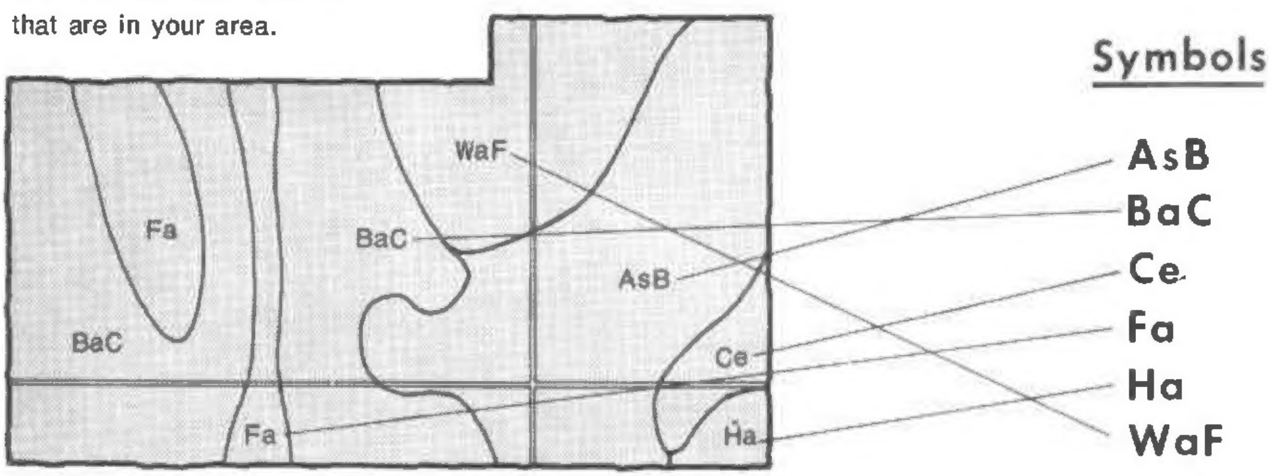
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



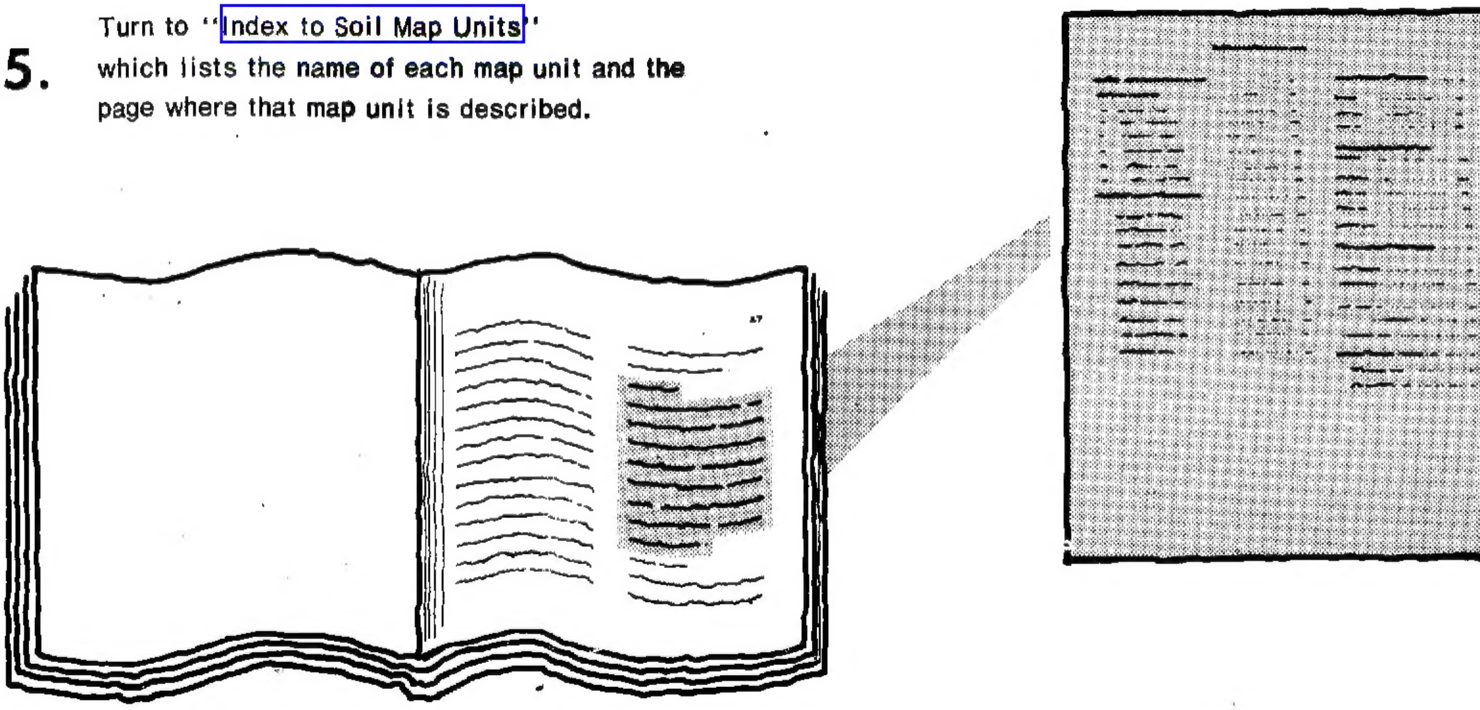


4. List the map unit symbols that are in your area.

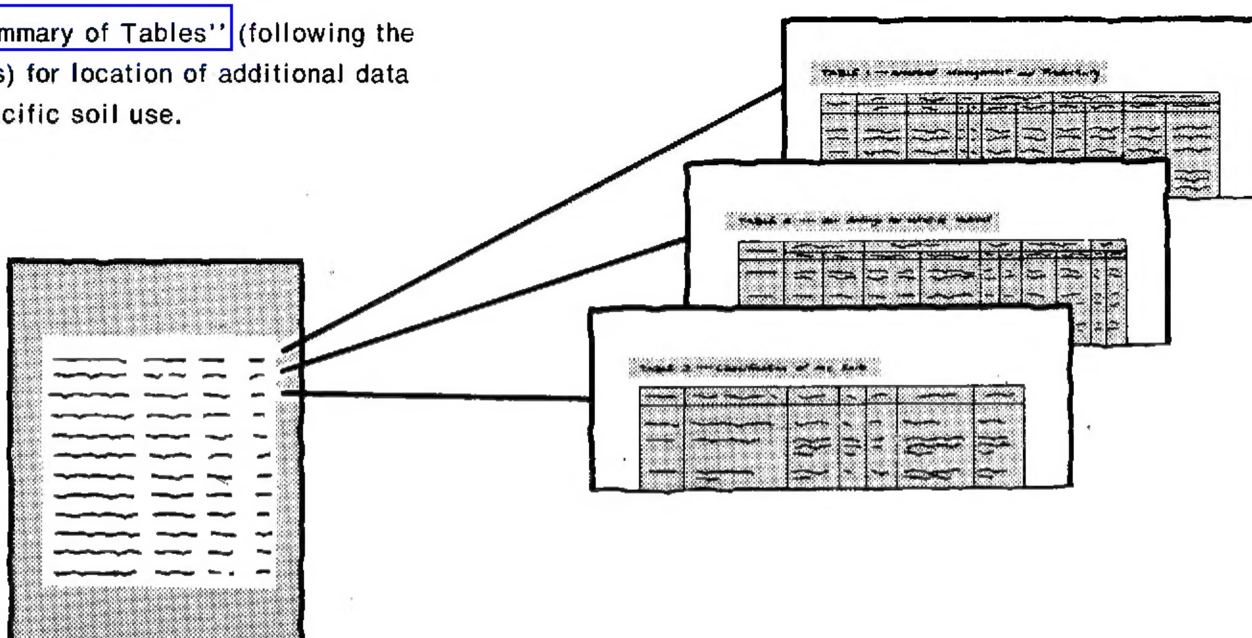


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1972-77. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service; the Indiana Department of Natural Resources, Soil and Water Conservation Committee; and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Clinton County Soil and Water Conservation District. Financial assistance was provided by the Clinton County Commissioners and the Indiana Department of Natural Resources.

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soil series

Issued November 1980

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summary of tables

foreword

This soil survey contains information that can be used in land-planning programs in Clinton County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Buell M. Ferguson

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State Conservationist
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Location of Clinton County in Indiana.

soil survey of
Clinton County, Indiana

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United States Department of Agriculture, Soil Conservation Service
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CLINTON COUNTY, located in the central part of Indiana, covers 260,480 acres, or about 407 square miles. The population is about 32,000. Frankfort is the county seat.

Clinton County is a generally flat plain dissected by creeks, streams, and drainageways. It has low relief and few abrupt changes in topography. The northwestern part of the county is rolling. The elevation ranges from 650 feet above sea level (where the Middle Fork of Wildcat Creek flows west into Tippecanoe County) to 940 feet (about two miles southeast of Kirklin along the Boone County line).

Most of the soils of Clinton County are farmed. Grain is the principal crop. Hogs are raised in the county. Much of the county has poor natural drainage and needs subsurface or surface drainage, or both.

Industry in Frankfort, in Lafayette in Tippecanoe County, and in Kokomo in Howard County provides employment for that part of the labor force not engaged in agriculture.

Wells are the main source of water in Clinton County. The principal source of ground water is sand and gravel layers in the glacial till. Part of the preglacial Teays River system in the southern part of the county supplies well water for Frankfort's industrial and municipal use.

Three federal highways pass through Clinton County. Interstate Highway 65 and U.S. Highway 52 cross the southwestern corner of the county. U.S. Highway 421 crosses the county from southeast to northwest. Several miles of state highways cross the county. Most county roads are on section or half-section lines and are paved.

There are a few small private airstrips in the county, and a small municipal airport is west of Frankfort. Frankfort is served by three railway lines. Most of the other towns in the county are served by one railroad.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Clinton County is cold in winter and quite hot in summer. Winter precipitation, frequently snow, results in substantial accumulation of soil moisture by spring and minimizes drought during summer on most soils. Normal annual precipitation is adequate for all crops that are suited to the temperature and length of growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Frankfort, Indiana in the period 1951 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Frankfort on January 28, 1963, is -23 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is

82 degrees. The highest recorded temperature, which occurred on July 4, 1954, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 39 inches. Of this, 24 inches, or 62 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 4.02 inches at Frankfort on May 24, 1971. Thunderstorms occur on about 45 days each year, and most occur in summer.

Average seasonal snowfall is 25 inches. The greatest snow depth at any one time during the period of record was 16 inches. On an average of 17 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in a variable pattern.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas*. Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic.

The names, descriptions, and delineations of map units on the general soil map of this county do not always agree or coincide with those in surveys of adjoining counties published earlier. This difference is partially the result of changes in concepts of soil series and in the application of the soil classification system. Other differences stem from differences in the proportions of soils in map units made up of two or three series. Still other differences are caused by the range in slope allowed within the map units of adjoining surveys. Also, a map unit in this county or adjacent counties is sometimes too small to be delineated.

1. Drummer-Raub

Nearly level, poorly drained and somewhat poorly drained, silty soils; on till plains

The soils of this map unit are on broad, nearly level till plains characterized by swell and swale topography (fig. 1). Drainage is mostly through ditches which empty into streams outside of the map unit. Slopes range from 0 to 2 percent.

This map unit makes up about 9 percent of the county. It is about 45 percent Drummer soils, 30 percent Raub soils, and 25 percent soils of minor extent.

Drummer soils are in broad depressions and swales and along narrow drainageways. They have a black silty clay loam surface layer and a dark gray, gray, and yellowish brown, mottled, silty clay loam, silt loam, and loam subsoil.

Raub soils are on rises. They have a very dark brown silt loam surface layer and a yellowish brown and light olive brown, mottled, silty clay loam and clay loam subsoil.

The soils of minor extent in this map unit are the well drained Parr soils on knobs and breaks along drainageways; the moderately well drained Dana and Proctor soils on rises and knobs; the somewhat poorly drained Brenton soils on slight rises; and the very poorly drained Mahalasville soils along drainageways and in broad depressions.

About 100 percent of the soils in this map unit are used for grain crops, pasture, or hay. Corn and soybeans are the main crops. Small areas are used for hay or pasture.

The soils in this map unit are well suited to corn and soybeans. Much of the corn is used to feed the many hogs that are raised in this area. Although wetness is a limitation for farming, adequate drainage has been established in most areas by the use of subsurface drains and open ditches.

The soils of this map unit are poorly suited to sanitary facilities and building site development because of wetness.

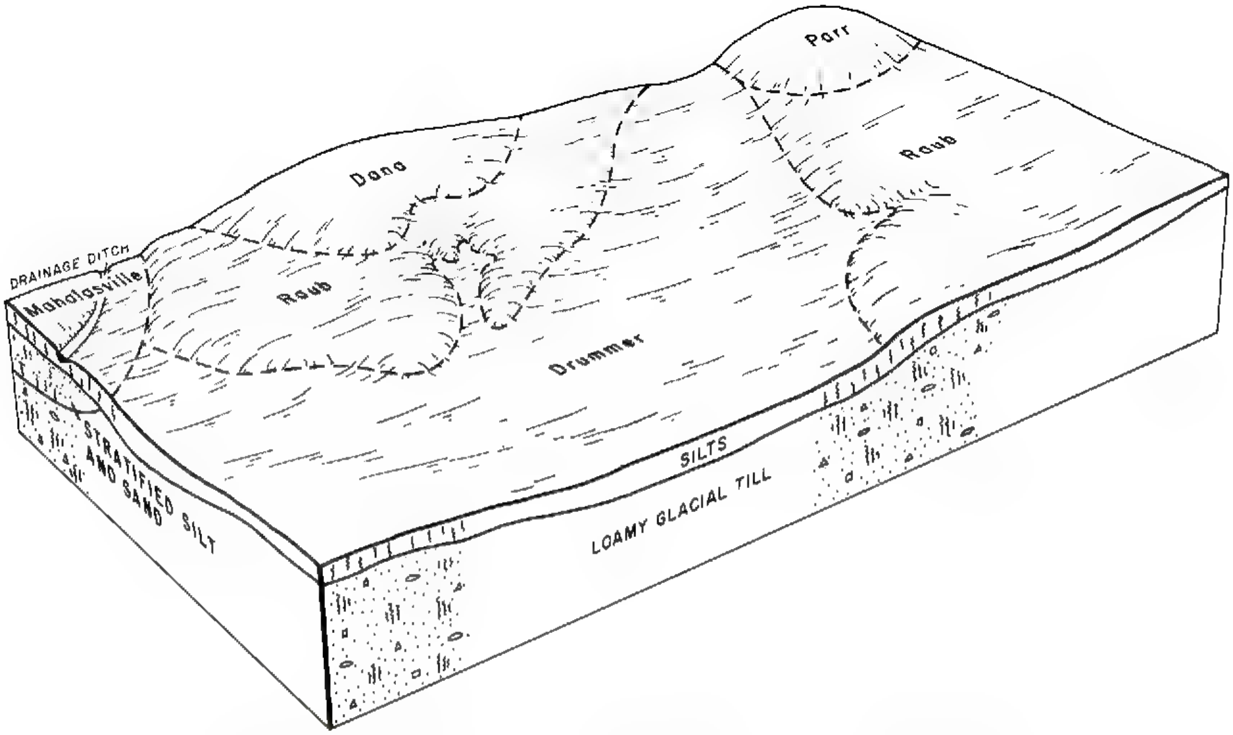

Figure 1.—Pattern of soils and the underlying material in the Drummer-Raub map unit.

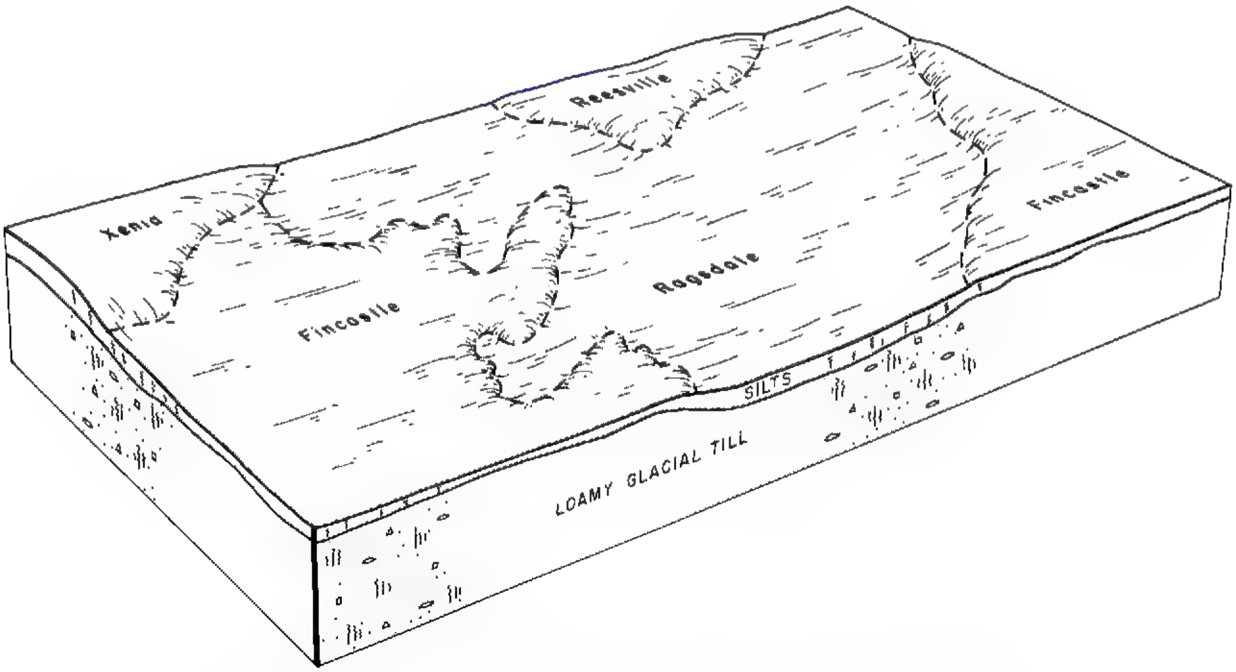

Figure 2.—Pattern of soils and the underlying material in the Ragsdale-Fincastle map unit.

2. Ragsdale-Fincastle

Nearly level, very poorly drained and somewhat poorly drained, silty soils; on till plains

The soils of this map unit are on broad, level till plains characterized by swell and swale topography (fig. 2). Drainage is mostly through ditches which empty into Potato Creek. Slopes range from 0 to 2 percent.

This map unit makes up about 10 percent of the county. It is about 45 percent Ragsdale soils, 36 percent Fincastle soils, and 19 percent soils of minor extent.

Ragsdale soils are in broad depressions and swales and along narrow drainageways. They have a very dark gray silt loam surface layer and a dark gray and grayish brown, mottled, silty clay loam subsoil.

Fincastle soils are on rises. They have a brown silt loam surface layer and a light brownish gray and yellowish brown, mottled, silt loam, silty clay loam, and clay loam subsoil.

The soils of minor extent in this map unit are the somewhat poorly drained Reesville soils on broad flats and slight rises; the moderately well drained Xenia and well drained Russell soils on knobs and breaks along drainageways; and the very poorly drained Mahalasville soils along drainageways and in broad depressions.

About 95 percent of this map unit has been cleared. These soils are used for corn, soybeans, small grain, and pasture (fig. 3). Corn and soybeans are the main crops. Some wheat is grown. Only a small percentage of the soils in this map unit are used for hay and pasture. Much of the corn is used to feed the many hogs that are raised in this area. Although wetness is a limitation for farming, adequate drainage has been established in most areas by the use of subsurface drains and open ditches.

The soils of this map unit are poorly suited to sanitary facilities and building site development because of wetness.

3. Cyclone-Fincastle-Crosby

Nearly level and gently sloping, poorly drained and somewhat poorly drained, silty soils; on till plains

The soils of this map unit are on broad, nearly level till plains characterized by swell and swale topography (fig. 4). Drainage is mostly through ditches which empty into Sugar Creek, Kilmore Creek, and Wildcat Creek. Slopes range from 0 to 3 percent.

Figure 3.—Nearly level, dark colored Ragsdale silt loam and light colored Fincastle silt loam recently planted to corn.

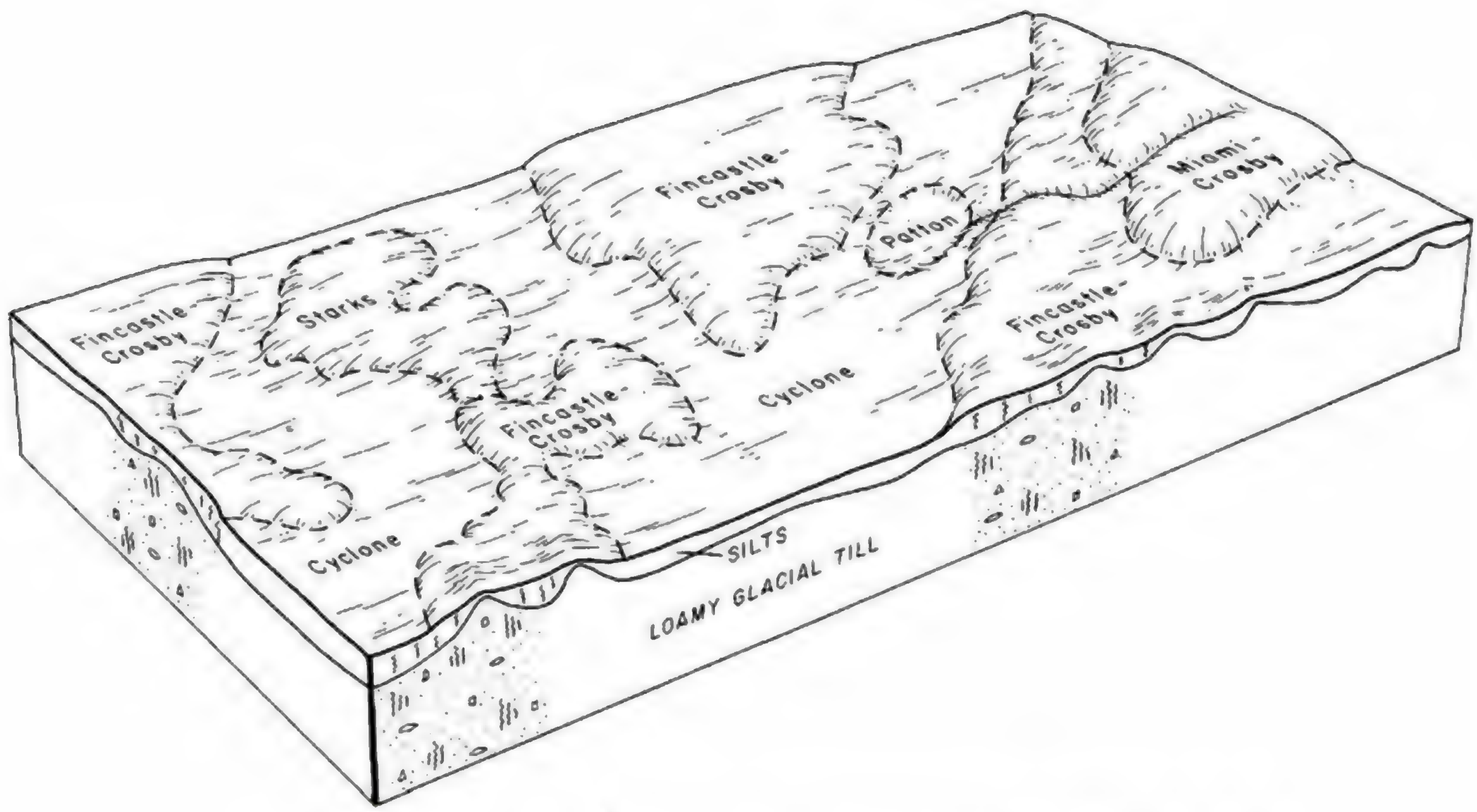

Figure 4.—Pattern of soils and the underlying material in the Cyclone-Fincastle-Crosby map unit.

This map unit makes up about 29 percent of the county. It is about 39 percent Cyclone soils, 25 percent Fincastle soils, 15 percent Crosby soils, and 21 percent soils of minor extent.

Cylone soils are in broad depressions and swales and along narrow drainageways. They have a very dark gray silt loam surface layer and a dark gray, grayish brown, and yellowish brown, mottled, silty clay loam and loam subsoil.

Fincastle soils are on rises. They have a brown silt loam surface layer and a yellowish brown, mottled, silty clay loam and clay loam subsoil.

Crosby soils are on higher-lying rises. They have a brown, silt loam surface layer and a yellowish brown, mottled, silty clay loam, clay loam, and loam subsoil.

The soils of minor extent in this map unit are the well drained Miami soils on knobs and breaks along drainageways; the poorly drained Patton soils in potholes and along drainageways; and Starks soils on slight rises.

About 90 percent of this map unit has been cleared. Corn, soybeans, and grain crops are grown. A small acreage is used for hay and pasture. Much of the corn is used to feed the many hogs that are raised in the area. Although wetness is a limitation for farming, adequate drainage has been established in most areas by the use of subsurface drains and open ditches.

These soils are poorly suited to sanitary facilities and building site development because of wetness.

4. Sable-Drummer

Nearly level, poorly drained, silty soils; on till plains

The soils of this map unit are on till plains characterized by broad depressions. Drainage is through ditches which empty into Sugar Creek and Wildcat Creek. Slopes range from 0 to 2 percent.

This map unit makes up about 5 percent of the county. It is about 36 percent Sable soils, 36 percent Drummer soils, and 28 percent soils of minor extent.

Sable and Drummer soils are in broad depressions. Sable soils have a black silty clay loam surface layer and a gray, light gray, and grayish brown, mottled, silty clay loam subsoil. Drummer soils have a black silty clay loam surface layer and a dark gray, gray, and yellowish brown, mottled, silty clay loam, silt loam, and loam subsoil.

The soils of minor extent in this map unit are the somewhat poorly drained Fincastle, Crosby, and Starks soils on slight rises.

About 98 percent of this map unit has been cleared. Corn and soybeans are the main crops. A small acreage is used for wheat. Much of the corn is used to feed the many hogs raised in this area. Although wetness is a limitation for farming, adequate drainage has been established in most areas by the use of subsurface drains and open ditches.

These soils are poorly suited to sanitary facilities and building site development because of wetness.

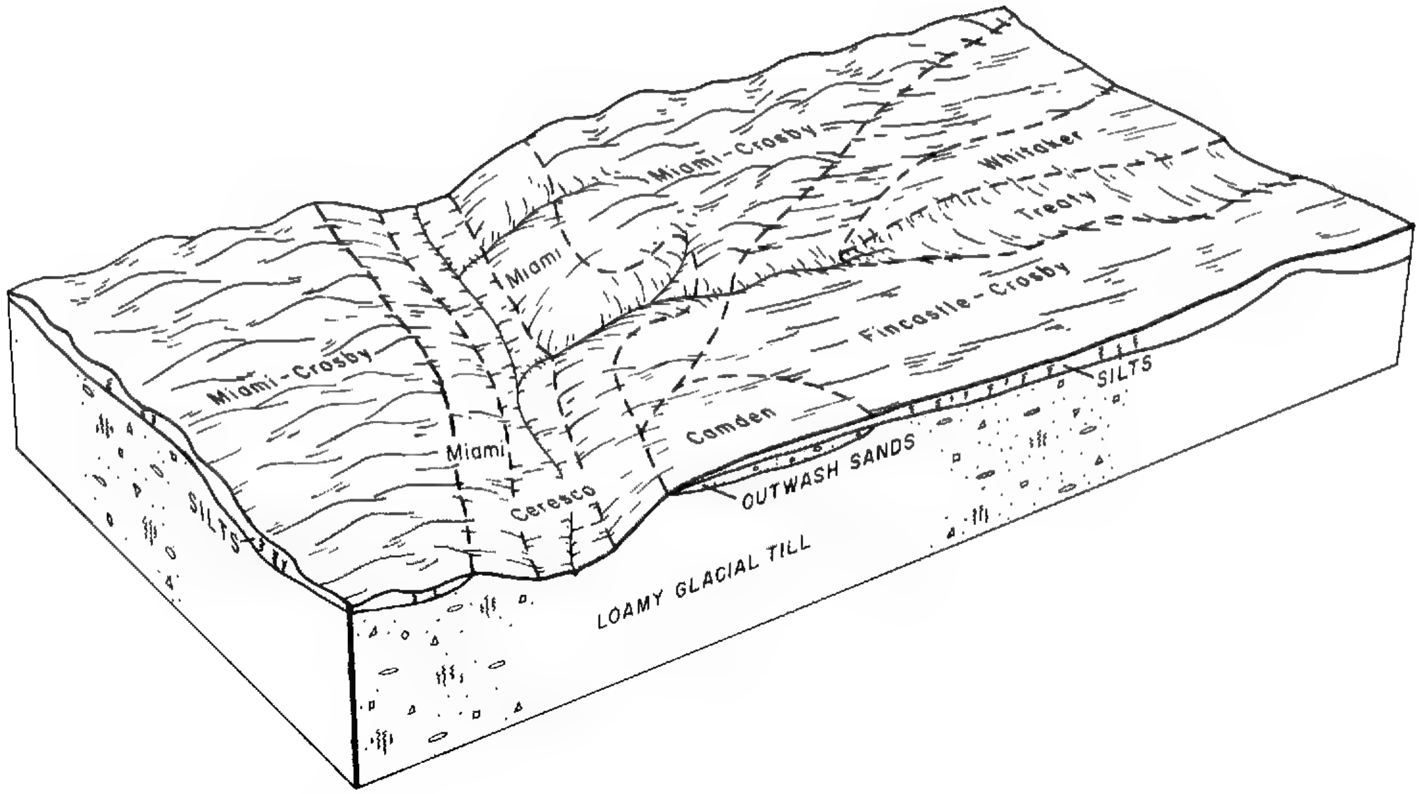

Figure 5.—Pattern of soils and the underlying material in the Miami-Crosby-Fincastle map unit.

5. Miami-Crosby-Fincastle

Strongly sloping to nearly level, well drained and somewhat poorly drained, silty and loamy soils; on till plains

The soils of this map unit are on rolling till plains which are dissected by many drainageways and small streams (fig. 5). Flat ridges are between the drainageways in some areas. Some areas along the larger streams are characterized by steep, short breaks. Slopes range from 0 to 18 percent.

This map unit makes up about 42 percent of,the county. It is about 23 percent Miami soils, 18 percent Crosby soils, 15 percent Fincastle soils, and 44 percent soils of minor extent.

The nearly level to strongly sloping Miami soils are on knobs and breaks along drainageways. They have a brown, silt loam surface layer and a dark yellowish brown and yellowish brown, clay loam and loam subsoil.

The nearly level to gently sloping Crosby soils are on rises and along drainageways. They have a brown silt loam surface layer and a yellowish brown, mottled, silty clay loam, clay loam, and loam subsoil.

The nearly level Fincastle soils are on rises and along drainageways. They have a brown silt loam surface layer and a light brownish gray and yellowish brown, mottled, silt loam, silty clay loam, and clay loam subsoil.

The soils of minor extent in this map unit are the very poorly drained Milford and Mahalasville soils in potholes and along drainageways; the poorly drained Treaty soils along drainageways; the well drained, steep Hennepin soils on breaks; the well drained Martinsville and Camden Variant soils on rises and morainal knobs; the somewhat poorly drained Ceresco soils on flood plains; and the somewhat poorly drained Whitaker soils on slight rises.

About 85 percent of this map unit has been cleared. Corn and soybeans are the main crops, but wheat is also grown. Some of the more rolling soils are used for hay and pasture. Beef cattle and hogs are raised in this area. Erosion and wetness are the main limitations if these soils are used for farming. Drainage is needed for optimum production on the Fincastle and Crosby soils.

Miami soils are suited to building site development. They are poorly suited to sanitary facilities because of moderately slow permeability. Fincastle and Crosby soils are poorly suited to building site development and sanitary facilities because of wetness.

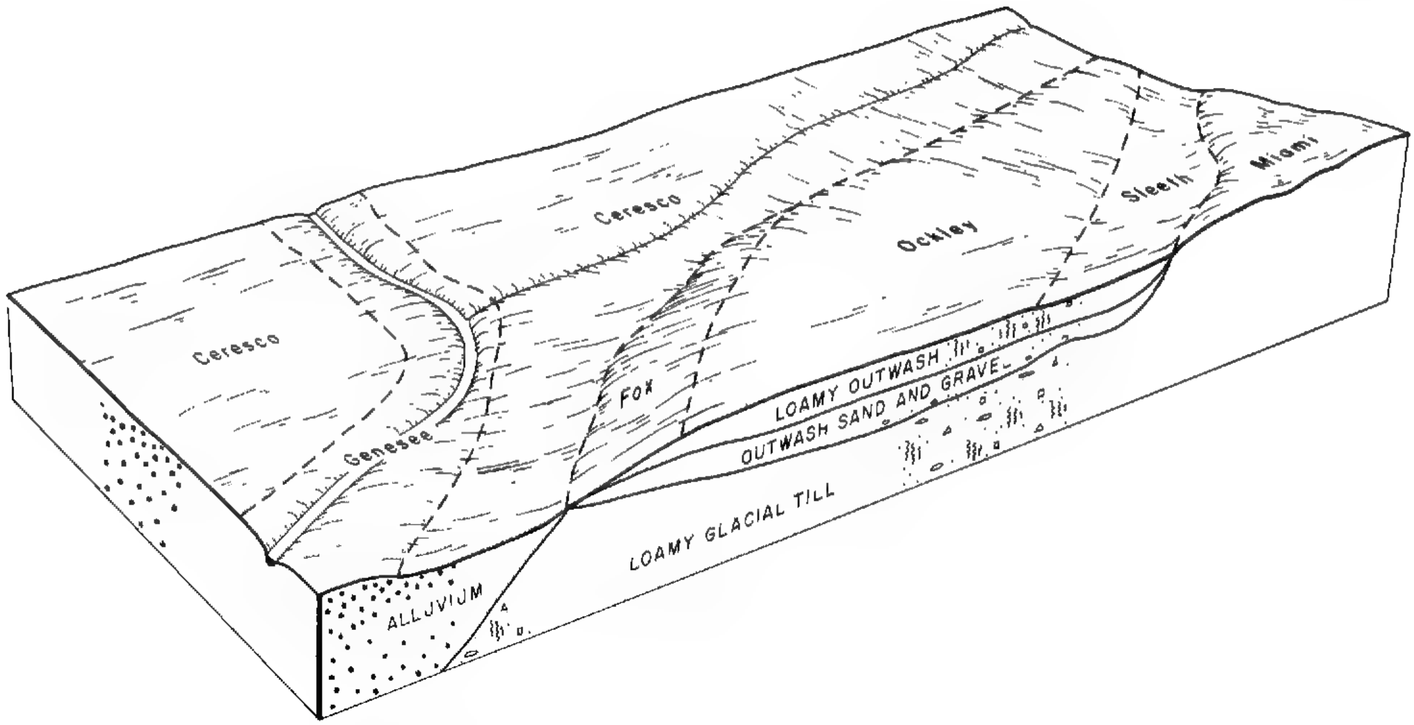

Figure 6.—Pattern of soils and the underlying material in the Ceresco-Ockley map unit.

6. Ceresco-Ockley

Nearly level and gently sloping, somewhat poorly drained and well drained, loamy and silty soils; on flood plains and terraces

The soils of this map unit are on flood plains and terraces (fig. 6). The flood plains are mostly narrow. The terraces are 5 to 30 feet higher than the flood plains and are mostly less than 1/4 mile wide.

This map unit makes up about 5 percent of the county. It is about 50 percent Ceresco soils, 15 percent Ockley soils, and 35 percent soils of minor extent.

Ceresco soils are on flood plains. They have a very dark grayish brown loam surface layer and a brown and grayish brown, mottled, loam subsoil.

Ockley soils are on terraces. They have a brown silt loam surface layer and a brown, dark brown, and reddish brown, silt loam, silty clay loam, clay loam, gravelly clay loam, and gravelly sandy clay loam subsoil.

The soils of minor extent in this map unit are the well drained Fox soils on terrace knobs and breaks; the somewhat poorly drained Sleeth and Whitaker soils in swales and on rises on terraces; the well drained Miami soils on adjacent upland till breaks; the well drained Genesee and Landes soils on flood plains; and the very poorly drained Sloan soils in flood plain swales.

About 65 percent of the soils of this map unit are used for corn and soybeans. The wetter flood plains and some steep slopes are used for pasture and woodland. Cash grain and beef cattle are the main enterprises. Flooding is the main limitation for farm use of the flood plain soils.

The Ockley soils are well suited to sanitary facilities and building site development. The Ceresco soils are generally unsuited to these uses because of flooding and wetness.

broad land use considerations

Map units 1, 2, 3, and 4 of the general soil map have good potential for farming and, if adequately drained, are very well suited to corn and soybeans. Map units 5 and 6 have fair potential for farming. Drainage is needed on most soils for optimum production, but the cost is usually justified by the yields obtained. Most soils being farmed are drained, and a high level of management is being utilized.

The Ockley soils of the Ceresco-Ockley map unit are suited to vegetables and other specialty crops. Organic soils, if drained, are also suited to these crops. The well drained soils are well suited to nurseries and orchards.

Most soils of the county have fair or good potential for trees, but a few areas are managed for commercial woodland production. Commercially valuable trees are most common on soils with good natural drainage (fig. 7). They grow more rapidly on these soils than on soils that are wet.

Figure 7.—A well managed stand of walnut trees on Ockley and Miami soils. These soils are suited to walnut trees.

The soils of the Miami-Crosby-Fincastle and Ceresco-Ockley map units have fair potential for parks and nature study areas. Hardwood forests enhance the beauty of parts of these map units. Some undrained areas provide habitat for many types of wildlife.

Urban development is taking place rapidly only in a narrow band around Frankfort. About 4 percent of the county is urban areas or developed land. The general soil map is helpful for planning the general outline of urban areas, but it cannot be used to select sites for specific urban structures.

Many of the soils in Clinton County are poorly suited to urban development. Urban development of the Ceresco soils of the Ceresco-Ockley map unit is severely limited because of flooding. The Ockley soils of the Ceresco-Ockley map unit are well suited to urban development, and some of the minor soils in this unit can also be used for urban development. Extensive drainage is required on the soils of all other units except the Miami-Crosby-Fincastle map unit. The Miami-Crosby-Fincastle map unit has a higher percentage of soils suited to urban development than map units 1, 2, 3, and 4.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Fox silt loam, 2 to 6 percent slopes, is one of several phases in the Fox series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Miami-Crosby silt loams, 2 to 6 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Be—Brenton silt loam. This nearly level, deep, somewhat poorly drained soil is on slight rises on outwash plains. Mapped areas are mostly irregular in shape, but some are oval. Areas range from 3 to 20 acres.

In a typical profile, the surface layer is very dark gray silt loam about 11 inches thick. The subsoil is about 43 inches thick. The upper part of the subsoil is brown and yellowish brown, mottled, firm silty clay loam and loam; the next part is yellowish brown, mottled, firm silty loam; and the lower part of the subsoil is yellowish brown, mottled, friable loamy sand. The underlying material to a depth of 60 inches is yellowish brown and grayish brown loamy sand. The profile formed in silty material is more than 40 inches thick in some areas. In places, loam till is within a depth of 46 inches. This soil has a thinner, lighter colored surface layer in places.

Included with this soil in mapping are small areas of Drummer, Mahalasville, and Patton soils in depressions. Also included are Dana and Proctor soils on slightly higher-lying areas. These inclusions make up about 15 percent of this map unit.

Permeability of this Brenton soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 3 feet late in winter and in spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are drained by subsurface drains and open ditches and are farmed. Nearly all areas are used for corn, soybeans, and small grain.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep pasture and soil in good condition.

Wetness is a severe limitation for building site development on this Brenton soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of low strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads needs to be strengthened with suitable material. Wetness is a severe limitation for septic tank absorption fields. Perimeter tile drainage can lower the seasonal high water table, but commercial sewers and treatment facilities are generally needed.

This Brenton soil is in capability class I and is not assigned to a woodland suitability subclass.

CbA—Camden Variant silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on till plains. Mapped areas are irregular in shape and range from 3 to 120 acres.

In a typical profile, the surface layer is brown and dark grayish brown silt loam about 12 inches thick. The subsoil is about 53 inches thick. The upper part of the subsoil is dark yellowish brown, firm silt loam, silty clay loam, and loam; the next part is dark yellowish brown and dark brown, friable sandy loam and loamy sand; and the lower part of the subsoil is yellowish brown, friable loam. The underlying material to a depth of 80 inches is yellowish brown, friable loam. The loess is as much as 44 inches thick in a few places. In some areas this soil has gray mottles below a depth of 24 inches.

Included with this soil in mapping are areas that have a slope of more than 2 percent; Fincastle and Starks soils on slightly lower-lying areas; and Russell, Miami, and Martinsville soils on more sloping areas. These inclusions make up about 12 to 15 percent of the map unit.

Permeability of this Camden Variant soil is moderate. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. This soil has a friable surface layer that is easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are farmed and used for corn and soybeans. Tomatoes and cucumbers are grown on this soil in the northern part of the county. A few areas are used for hay and pasture or remain in woodland. Gravel pits are located on this soil near Jefferson. Areas of this soil are a potential source of sand and gravel, but a 5- to 8-foot overburden generally covers the sand and gravel (fig. 8).

Figure 8.—Stratified sand and gravel is at a depth of 5 to 8 feet in Camden Variant silt loam, 0 to 2 percent slopes

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for woodland. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on this soil. Foundations, footings, and basement walls should be properly designed and foundation drains should be used to prevent structural damage caused by shrinking and swelling of the soil. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. This soil has slight limitations for septic tank absorption fields.

This Camden Variant soil is in capability class I and woodland suitability subclass 1o.

Ce—Ceresco loam. This nearly level, deep, somewhat poorly drained soil is on flood plains. Areas are occasionally flooded. Most mapped areas are elongated and parallel streams, but some areas are in narrow drainageways that extend into uplands. Areas range from 3 to 100 acres.

In a typical profile, the surface layer is very dark grayish brown loam about 10 inches thick. The subsoil is mottled, friable loam 23 inches thick. The upper part of the subsoil is brown and the lower part is grayish brown. The underlying material to a depth of 42 inches is grayish brown, mottled, friable sandy loam. Below this to a depth of 60 inches is grayish brown sand and loamy sand. Gravel is below a depth of 30 inches in several areas. In the upper reaches of some small streams, firm loam till is at a depth of 45 to 60 inches.

Included with this soil in mapping are a few small, slightly depressional areas of Sloan soils. Also included are Genesee and Landes soils on slightly higher elevations. Some areas of this map unit which are next to the base of upland or terrace breaks stay wet for long periods because of seepage from the higher-lying areas. These inclusions make up about 10 to 15 percent of this map unit.

Permeability of this Ceresco soil is moderate or moderately rapid. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 2 feet mainly in winter and spring. The surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn and soybeans. Some areas are used for pasture or hay. Some farmed areas are drained by subsurface drains. Small inaccessible areas and areas that are dissected by overflow channels remain in woodland. A gravel pit is along Sugar Creek. Several small abandoned pits are also in this map unit.

This soil is suited to corn and soybeans. Wetness is the major limitation and flooding is the major hazard for farm use of this soil. This soil is poorly suited to winter-seeded and early spring-seeded crops because of the occasional flooding. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Drainage is necessary for high yields in some areas. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely grazing, and restricted use during wet periods will help to keep the soil in good condition.

This soil is suited to trees, and several areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

This Ceresco soil has severe limitations for building site development, and it is generally unsuited to this use because of flooding and wetness. This soil has severe limitations for local roads and streets because of flooding and frost action potential. Elevating the roadbed and constructing drainage ditches help to overcome these limitations. This soil has severe limitations for septic tank absorption fields because of wetness and flooding. Alternate sites should be considered.

This Ceresco soil is in capability subclass IIIw and woodland suitability subclass 2o.

Cy—Cyclone silt loam. This nearly level, deep, poorly drained soil is in depressions and on broad level flats on till plains. This soil is ponded by runoff from higher-lying areas. Mapped areas are irregular in shape, and fingers extend between somewhat poorly drained soils. Areas range from 3 to 500 acres, but most are between 40 and 150 acres.

In a typical profile, the upper part of the surface layer is very dark gray silt loam about 9 inches thick and the lower part is black silt loam about 5 inches thick. The subsoil is 46 inches thick. The upper part of the subsoil is dark gray and grayish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam and loam. The underlying material is yellowish brown loam. Light colored soil has washed in on the dark surface layer in some areas.

Included with this soil in mapping are small convex areas of somewhat poorly drained Fincastle and Starks soils. Areas of Treaty, Ragsdale, and Mahalasville soils are also included. These inclusions make up about 20 percent of this map unit.

Permeability of this Cyclone soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is ponded or very slow. A seasonal high water table is near or above the surface in the winter and spring. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Fall plowing is beneficial to tillage operations performed the next spring.

Most areas of this soil are drained and used for corn, soybeans, and wheat. Drainage is by subsurface drains, open ditches, surface drains, or a combination of these. A few small areas remain in woodland.

This soil is well suited to corn and soybeans. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes for pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing keep the pasture and soil in good condition.

This soil is suited to trees. Woodland management concerns are severe for equipment use, plant competition, seedling mortality, and windthrow hazard. Trees that tolerate wetness should be favored in stands. Harvesting may be delayed until dry seasons or until the ground is frozen. Competing vegetation should be controlled by cutting, spraying, or girdling.

Ponding is a severe limitation for building site development on this Cyclone soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, low support strength, and frost action potential. Drainage ditches along roads lower the water table and prevent damage caused by frost action. The base for roads and streets needs to be strengthened with suitable material. Roadbeds should be elevated. This soil has a severe limitation for septic tank absorption fields because of ponding. Alternate sites should be considered.

This Cyclone soil is in capability subclass IIw and woodland suitability subclass 2w.

DaA—Dana silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on slight rises and knobs on broad till plains. Mapped areas are irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is very dark grayish brown silty loam about 10 inches thick. The subsoil is yellowish brown and is about 30 inches thick. The upper part of the subsoil is firm silty clay loam and the lower part is mottled, firm clay loam. The underlying material to a depth of 60 inches is brown loam. In some areas this soil has a thin layer of loamy and silty outwash above the till. Other areas of this soil that are near Fincastle soils have a dark surface layer less than 10 inches thick. In some areas the thickness of the combined surface layer and subsoil developed from silty material is as much as 50 inches.

Included with this soil in mapping are small areas of Raub soils that have slope of more than 2 percent; Drummer and Mahalasville soils in swales and depressions; Parr soils; and similarly textured soils which have a mottle-free subsoil. These inclusions make up about 15 percent of this map unit.

Permeability of this Dana soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is slow. A seasonal perched water table is often at a depth of 3 to 6 feet early in spring. This soil has a friable surface layer that is easily tilled throughout a fairly wide range of moisture content.

Nearly all of this soil is farmed and used for corn, soybeans, and small grain. A few small areas are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is well suited to grasses or legumes for hay or pasture. Overgrazing and grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil has moderate limitations for building site development because of wetness and shrink-swell potential. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. Foundation drains help to overcome the wetness. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. Drainage ditches along roads help to reduce frost action. This soil has severe limitations for septic tank absorption fields because of wetness and moderately slow permeability. Perimeter tile helps to lower the water table.

This Dana soil is in capability class I and is not assigned to a woodland suitability subclass.

DaB—Dana silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on rises on broad till plains. Mapped areas are irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is yellowish brown and is about 30 inches thick. The upper part of the subsoil is firm silty clay loam and the lower part is mottled, firm clay loam. The underlying material to a depth of 60 inches is brown loam. In places the silty layers are less than 24 inches thick. In places till is within a depth of 36 inches. Slope is less than 2 percent in some areas.

Included with this soil in mapping are small areas of

Raub and Drummer soils on flats and in swales. Also included are small, severely eroded areas which have a silty clay loam surface layer. These inclusions make up about 15 percent of this map unit.

Permeability of this Dana soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is moderate. A seasonal perched water table is at a depth of 3 to 6 feet early in spring. The friable surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain.

This soil is suited to corn, soybeans, and small grain. Crop rotation, minimum tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help to prevent erosion. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

Grasses and legumes for hay or pasture effectively control water erosion. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil has moderate limitations for building site development because of wetness and shrink-swell potential. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. Foundation drains help to overcome the wetness. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. Drainage ditches along roads help to reduce frost action. This soil has severe limitations for septic tank absorption fields because of wetness and moderately slow permeability. Perimeter tile will help to lower the water table.

This Dana soil is in capability subclass IIe and is not assigned to a woodland suitability subclass.

Dr—Drummer silty clay loam. This nearly level, deep, poorly drained soil is in depressions and on broad level flats on uplands. This soil is often ponded by runoff from adjacent areas. Mapped areas are mostly irregular in shape, but many are oval. Areas range from 3 to 500 acres.

In a typical profile, the surface layer is black silty clay loam about 14 inches thick. The subsoil is firm and mottled and is about 48 inches thick. The upper part of the subsoil is very dark gray, dark gray, and gray silty clay loam; the next part is yellowish brown silt loam; and the lower part is yellowish brown loam. The underlying material to a depth of 70 inches is gray loam. The depth to loam till is as much as 80 inches in places. The dark surface layer is as much as 24 inches thick in areas where overwash has accumulated.

Included with this soil in mapping are small areas of Milford and Patton soils in potholes. Also included are small, slightly elevated areas of soils which have a browner subsoil. Sable and Mahalasville soils are also included. These inclusions make up about 25 percent of this map unit.

Permeability of this Drummer soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow to ponded. A seasonal high water table is near or above the surface in winter and early in spring. This soil has a surface layer that becomes cloddy and hard to work if tilled when wet. Where erosion is not a hazard, fall plowing is beneficial to tillage operations performed the following spring.

Nearly all areas of this soil are drained by subsurface drains, open ditches, surface drains, or a combination of these. These areas are used for corn, soybeans, and wheat. A few areas are used for hay and pasture.

This soil is well suited to corn and soybeans. Wetness is the main limitation for farm use of this soil. Conservation tillage and crop residue management help to improve and maintain tilth and organic matter content of the soil.

This soil is suited to grasses and legumes for hay or pasture. Drainage is necessary to obtain high yields for forage or pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to reduce surface compaction and maintain good tilth.

Ponding is a severe limitation for building site development on this soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, low support strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads and streets needs to be strengthened with suitable material. The limitation for septic tank absorption fields is severe because of ponding. Commercial sewers and treatment facilities are usually needed.

This Drummer soil is in capability subclass IIw and is not assigned to a woodland suitability subclass.

FcA—Fincastle silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on slight rises on broad till plains. Mapped areas are irregular in shape and range from 3 to 300 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick (fig. 9). The subsoil is about 51 inches thick. The upper part of the subsoil is light brownish gray, friable silt loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part of the subsoil is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 70 inches is yellowish brown, mottled loam.

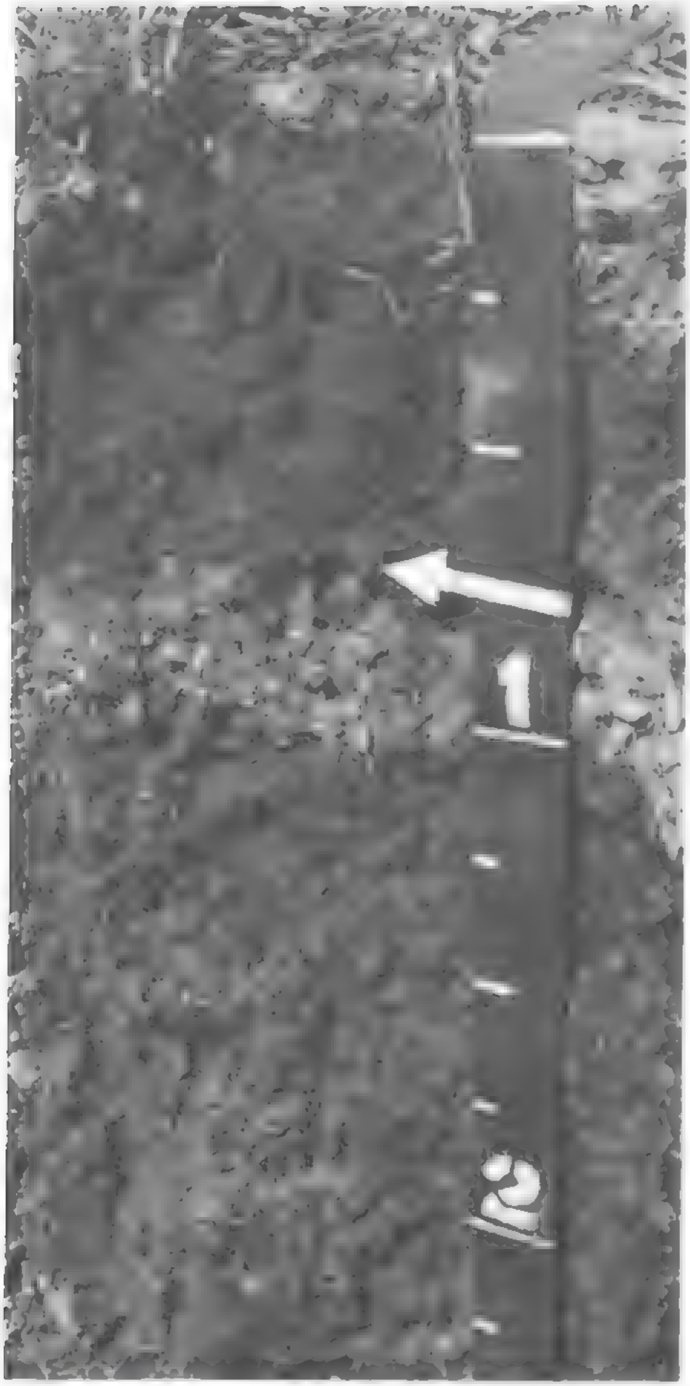

Figure 9.—A typical profile of Fincastle silt loam, 0 to 2 percent slopes. The surface layer is shown by the pointer. The firm, moderately fine textured subsoil is below a depth of about 13 inches.

Included with this soil in mapping are small areas of soils that have a silty clay subsoil and are in slight depressions. Also included are small areas of Russell and Xenia soils on higher-lying areas, Cyclone and Ragsdale soils in depressions, and Crosby and Starks soils on land forms similar to the Fincastle soil. These inclusions make up about 15 percent of this map unit.

Permeability of this Fincastle soil is moderately slow in the subsoil and slow in the underlying till. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 foot to 3 feet in winter and early in spring. The surface layer is easily tilled throughout a fairly wide range in moisture content. However, the soil surface crusts after a heavy rain.

Most areas of this soil are adequately drained and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, woodland, or truck crops.

This soil is suited to corn, soybeans, small grain, and truck crops. Wetness is the main limitation for farm use of this soil, but it can be controlled by subsurface drains, open ditches, or both. Minimum tillage and retaining crop residue on the soil surface helps to maintain tilth and organic matter content.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing will help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for woodland. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation for building site development on this soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for roads and streets because of low support strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads needs to be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Perimeter tile drainage will help to lower the water table, but commercial sewers and treatment facilities are usually needed.

This Fincastle soil is in capability subclass IIw and woodland suitability subclass 3o.

FdA—Fincastle-Crosby silt loams, 0 to 3 percent slopes. These nearly level and gently sloping, deep, somewhat poorly drained soils are on till plains. Mapped areas are irregular in shape and range from 3 to 300 acres. This complex is about 55 percent Fincastle soil and 30 percent Crosby soil. Fincastle soil is on the broader, less sloping part of this map unit. Crosby soil is on the higher-lying rises and the more sloping areas

along drainageways. These soils are so intricately mixed or in such small areas that it was not practical to separate them in mapping.

In a typical profile of Fincastle soil, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 38 inches thick. The upper part of the subsoil is grayish brown, mottled, friable silt loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part of the subsoil is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam.

In a typical profile of Crosby soil, the surface layer is brown silt loam about 8 inches thick. The subsoil is yellowish brown and mottled and is about 32 inches thick. The upper part of the subsoil is firm silty clay loam and the lower part is firm clay loam and loam. The underlying material to a depth of 60 inches is yellowish brown loam. In places the lower part of the subsoil developed in loamy outwash. In some of the more sloping areas, loam till is within a depth of 10 inches and the silty clay loam subsoil is not present.

Included with these soils in mapping are small areas of Miami and Xenia soils on knobs; Treaty and Mahalasville soils in depressions and along drainageways; and severely eroded soils on the more sloping areas. Starks soils are also included and are usually near the poorly drained soils. These inclusions make up about 12 to 15 percent of the map unit.

Permeability of the Fincastle soil is moderately slow in the subsoil and slow in the underlying till. The Crosby soil is slowly permeable. The available water capacity of these soils is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 foot to 3 feet in winter and early in spring. The surface layer is easily tilled throughout a fairly wide range in moisture content except in the eroded areas. A crusts often forms on the surface following a heavy rain.

Most areas of this soil have been adequately drained and are used for corn, soybeans, and small grain. A few areas are used for hay, pasture, woodland, or truck crops.

These soils are suited to corn, soybeans, small grain, and truck crops. Wetness is a major limitation for farming, but can be overcome by subsurface drains, open ditches, or both. Terraces, grassed waterways, conservation tillage, and diversions can control erosion on the more sloping areas.

These soils are suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soils are wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soils in good condition.

These soils are suited to trees, but they are seldom used for woodland. Most woodland management concerns are slight. Plant competition is moderate and competing vegetation should be controlled by cutting, spraying, or girdling.

These soils have a severe limitation for building site development because of wetness. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. These soils have severe limitations for local roads and streets because of low support strength and frost action potential. Drainage ditches along roads lower the water table and help to reduce damage from frost action. The base for roads needs to be strengthened with suitable material. These soils have severe limitations for septic tank absorption fields because of wetness and slow permeability. Perimeter tile drainage can help to lower the water table, but commercial sewers and treatment facilities are usually needed.

The Fincastle and Crosby soils of this complex are in capability subclass IIw and woodland suitability subclass 3o.

FsB—Fox silt loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on broad terraces and small dome-shaped areas on the uplands. It is moderately deep over sand and gravelly sand. Most mapped areas on terraces are elongated and range from 3 to 25 acres. The upland areas are irregular in shape and range from 3 to 10 acres.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 27 inches thick. The upper part of the subsoil is dark yellowish brown, friable silt loam; the next part is dark brown, firm clay loam, gravelly clay loam, and sandy clay loam; and the lower part of the subsoil is dark reddish brown gravelly sandy clay loam. The upper part of the underlying material is dark brown gravelly loamy sand. Below this to a depth of 60 inches is yellowish brown sand and gravelly coarse sand. In places the underlying sand and gravel is thin and loam till is at a depth of less than 60 inches. In places the underlying material is mainly sand with only a few pebbles.

Included with this soil in mapping are Sleeth soils in slight depressions; soils that have a slope of more than 6 percent; shallow soils on steep breaks; and small areas of severely eroded soils. Small areas of Ockley and Miami soils are also included. These inclusions make up about 15 percent of the map unit.

Permeability of this Fox soil is moderate in the subsoil and rapid in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is moderate. Surface runoff is medium. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn, soybeans, and small grain. A few areas are used for hay, pasture, and woodlots. Areas of this soil along larger streams are potential sources of sand and gravel. Thickness of the sand and gravel ranges from a few inches to more than 15 feet along the larger streams in the western part of the county (fig. 10).

Figure 10.—The underlying material of Fox soils is stratified sand and gravel. This pit is being used as a commercial source of sand and gravel.

This soil is well suited to small grain and less suited to corn and soybeans. Crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to control erosion. Crop residue retained on the soil surface throughout the year protects the soil from erosion and also helps to develop and maintain good soil structure and tilth.

Grasses and legumes for hay and pasture effectively control wind and water erosion. Such deep-rooted legumes as alfalfa are well suited to this soil. Proper stocking rates, pasture rotation, and timely grazing will help to maintain the pasture and soil in good condition.

This soil is suited to trees, and a few small areas are wooded. Most woodland management concerns are slight. Competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on this Fox soil. Dwellings and small buildings should have footings designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has moderate limitations for local roads and streets because of frost action potential and shrink-swell potential. The base for roads needs to be strengthened with suitable material. This soil has a severe limitation for septic tank absorption fields because of possible ground water pollution.

This Fox soil is in capability subclass IIe and woodland suitability subclass 2o.

FsC—Fox loam, 6 to 15 percent slopes. This moderately sloping, well drained soil is on terrace escarpments, on side slopes adjacent to drainageways, on terraces, and on knobs in uplands. It is moderately deep over sand and gravelly sand. Mapped areas on terraces are mostly elongated, parallel streams, and range from 3 to 20 acres. Upland areas are irregular in shape and range from 3 to 25 acres.

In a typical profile, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark brown and is about 26 inches thick. The upper part of the subsoil is firm clay loam and gravelly clay loam, and the lower part is sandy clay loam and gravelly sandy clay loam. The underlying material to a depth of 60 inches is sand and gravelly sand. In small severely eroded areas, the surface layer is gravelly clay loam, clay loam, or gravelly loam. In places the underlying sand and gravel is thin, and loam till is at a depth of less than 60 inches.

Included with this soil in mapping are areas that have a slope of more than 15 percent and small areas of Miami soils. These inclusions make up about 15 percent of this map unit.

Permeability of this Fox soil is moderate in the subsoil and rapid in the underlying material. The available water capacity is low. The organic matter content of the surface layer is moderate. Surface runoff is medium. The surface layer in the more eroded areas becomes cloddy if tilled when wet because of poor soil structure and the absence of organic matter.

Most areas of this soil are used for pasture, hay, or woodland. Some areas are used for corn, soybeans, and small grain.

This soil is poorly suited to corn and soybeans because of the erosion hazard. This soil is droughty during dry periods. Fall seeded crops are well suited to this soil. Crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to prevent soil erosion and improve and maintain tilth and organic matter. Steep areas included in this map unit should remain in grass or woodland.

This soil is suited to grasses and legumes. Grasses and legumes effectively control water erosion. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, and some areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Moderate slope and shrink-swell potential are moderate limitations for building site development on this Fox soil. Foundations and footings should be designed to prevent structural damage caused by shrinking and swelling of the soil. Buildings should be constructed on the less sloping areas. As much existing vegetation as possible should be retained. Topsoil needs to be stockpiled and promptly replaced, and exposed areas should be reseeded as soon as possible after construction.

This soil has moderate limitations for local roads and streets because of slope, frost action potential, and shrink-swell potential. The base for roads needs to be strengthened with suitable material. Local roads and streets should be built on the contour. This soil has a severe limitation for septic tank absorption fields because of possible ground water pollution.

This Fox soil is in capability subclass IIIe and woodland suitability subclass 2o.

Gn—Genesee silt loam, sandy substratum. This nearly level, deep, well drained soil is on flood plains. It is occasionally flooded. Mapped areas are mostly elongated and parallel streams. Areas range from 3 to 250 acres.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is brown, friable loam about 9 inches thick. The underlying material to a depth of 49 inches is brown and dark yellowish brown, friable loam and sandy loam. Below this to a depth of 60 inches is yellowish brown sand. Some profiles do not have carbonates within a depth of 40 inches.

Included with this soil in mapping are small areas of Ceresco soils, areas which have loose sand and gravelly sand below a depth of 18 inches, and small areas of Landes soils. These inclusions make up about 10 to 15 percent of this map unit.

Permeability of this Genesee soil is moderate above a depth of 49 inches and rapid below that depth. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Most areas of this soil are farmed and used for corn and soybeans. Some areas are used for pasture and hay. Small inaccessible areas and areas dissected by overflow channels remain in woodland.

This soil is suited to corn, soybeans, and small grain. Floodwater may damage fall-seeded and early spring-seeded crops. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Proper stocking rates, pasture rotation, and timely grazing help to keep the soil in good condition.

This soil is suited to trees. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

This soil has a severe limitation for building site development, local roads and streets, and septic tank absorption fields and is generally unsuited to these uses because of flooding. Alternate sites should be considered.

This Genesee soil is in capability subclass IIw and woodland suitability subclass 1o.

HeF—Hennepin silt loam, 18 to 50 percent slopes. This moderately steep to very steep, deep, well drained soil is on short upland breaks. Slopes are dominantly 25 to 40 percent and are 50 to 100 feet long. Mapped areas range from 5 to 80 acres and are usually dissected by drainageways.

In a typical profile, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsoil is brown, friable loam about 7 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the combined surface layer and subsoil is less than 10 inches thick.

Included with this soil in mapping are small areas of Fox soils and severely eroded soils which have a clay loam surface layer. Also included are small areas of gently sloping to strongly sloping Miami soils on ridgetops and side slopes, and small areas where loose sand and gravel is at depths of less than 20 inches. These inclusions make up 10 to 15 percent of the unit.

Permeability of this Hennepin soil is moderately slow. The available water capacity is moderate. The organic matter content of the surface layer is moderate. Surface runoff is rapid or very rapid.

Most areas of this soil are used for woodland. A few areas are used for pasture and as wildlife habitat (fig. 11).

Figure 11.—A recently constructed wildlife pond on Hennepin silt loam, 18 to 50 percent slopes.

This soil is not suited to row crops or small grain because of steep slope. It is poorly suited to forage production because the steep slope hinders establishment and harvest. This soil is suited to permanent pasture in areas where the slope is near 18 percent. Timely grazing and pasture rotation help to keep the pasture and soil in good condition.

This soil is suited to trees. Woodland management concerns are moderate for plant competition, erosion hazard, and equipment use. Competing vegetation should be controlled by cutting, spraying, or girdling. Logging trails should be planned to minimize erosion.

This soil has a severe limitation for building site development, septic tank absorption fields, and local roads and streets, and it is generally unsuited to these uses because of steep slope. Slow permeability is also a severe limitation for septic tank absorption fields. It is usually best to leave this soil in woodland and use the adjacent flatter areas as building sites.

This Hennepin soil is in capability subclass VIIe and woodland suitability subclass 1r.

Ho—Houghton muck, undrained. This nearly level, deep, very poorly drained soil is in potholes on uplands. It is frequently ponded by runoff from adjacent areas. Mapped areas are usually oval and range from 2 to 30 acres.

In a typical profile, the surface layer is very dark gray muck about 9 inches thick. Between 9 and 16 inches the subsurface tier is very dark brown muck. Below this to a depth of 60 inches is dark brown, friable muck. The organic material is not as highly decomposed in some profiles. Mineral material has been mixed with the surface layer in many profiles.

Included with this soil in mapping are small areas of Palms and Wallkill soils. Also included are small areas of Patton and Milford soils at the edge of mapped areas. These soils make up 5 to 10 percent of this map unit.

Permeability of this Houghton soil is moderately slow to moderately rapid. The available water capacity is very high. The organic matter content of the surface layer is very high. Surface runoff is ponded or very slow. A seasonal high water table is near or above the surface mainly in winter and spring. The surface layer is friable and can be tilled throughout a wide range in moisture content.

Most areas of this soil are idle. Wetland weeds and shrubs are the dominant vegetation. A few areas are in pasture. Some areas of this soil have been drained by subsurface drains, surface drains, open ditches, or a combination of these. Drainage is difficult in some areas because there are few adequate outlets. Pumping stations could be used in conjunction with other drainage practices to drain the lowest lying areas. Subsidence is often a problem after drainage has been established.

Desirable grasses and legumes do not grow well on this soil unless drainage is established. In many pasture areas the dominant grass is wetland weeds.

This soil is not suited to trees except for a few water-tolerant types. Most woodland management concerns are severe. The erosion hazard is slight. Harvesting of trees is confined to extremely dry seasons or to periods when the ground is frozen.

This soil has severe limitations for building site development, local roads and streets, and septic tank absorption fields, and it is generally unsuited to these uses because of ponding or low support strength. Alternate sites should be used.

This Houghton soil is in capability subclass Vw and woodland suitability subclass 4w.

La—Landes fine sandy loam. This nearly level, deep, well drained soil is on flood plains. This soil is occasionally flooded. Mapped areas are mostly elongated and parallel streams. Areas range from 3 to 75 acres.

In a typical profile, the surface layer is dark brown fine sandy loam about 10 inches thick. The subsoil is yellowish brown, friable fine sandy loam about 20 inches thick. The underlying material is yellowish brown loamy fine sand.

Included with this soil in mapping are small areas of Ceresco and Genesee soils. The surface layer, subsoil, and underlying material is loose sand in a few areas. These inclusions make up about 10 to 15 percent of this map unit.

Permeability of this Landes soil is moderately rapid or rapid. The available water capacity is moderate. Organic matter content of the surface layer is high. Surface runoff is slow. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for pasture. Small inaccessible areas and areas dissected by overflow channels remain wooded. Corn and soybeans are grown in some areas.

This soil is suited to corn, soybeans, and small grain, but it is droughty in dry years. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. However, floodwater can damage these crops in winter and early in spring. Proper stocking rates, pasture rotation, and timely grazing help to keep the soil in good condition.

This soil is suited to trees. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

This soil has a severe limitation for building site development, local roads and streets, and septic tank absorption fields, and it is generally unsuited to these uses because of occasional flooding. Pollution of underground water supplies is a severe hazard for septic tank absorption fields. Alternate sites should be considered.

This Landes soil is in capability subclass IIIs and woodland suitability subclass 1o.

Ma—Mahalasville silty clay loam. This nearly level, deep, very poorly drained soil is in depressions on lake plains and along drainageways on till plains. It is ponded by runoff from adjacent areas. Mapped areas are mostly irregular in shape, but many are oval or elongated. The elongated areas usually parallel drainageways. Areas range from 3 to 300 acres.

In a typical profile, the surface layer is black silty clay loam about 16 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is very dark gray and gray, mottled, firm silty clay loam; and the lower part is gray, mottled, firm clay loam. The underlying material to a depth of 60 inches is gray, mottled loam with strata of silt loam and loamy sand. In places the dark surface layer is as much as 24 inches thick. In places the original black surface layer is covered with light colored soil that washed from surrounding higher-lying areas.

Included with this soil in mapping are small, slightly elevated areas of Brenton, Starks, and Whitaker soils. Small, lower-lying, undrained areas that stay wet for long periods are included. A few small areas have a mucky surface layer. Small areas of Westland, Cyclone, Patton, and Ragsdale soils are also included. These inclusions make up about 20 percent of this map unit.

Permeability of this Mahalasville soil is slow in the subsoil and moderately rapid in the substratum. The

available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow or ponded. A seasonal high water table is near or above the surface in winter and spring. Some areas along larger drainageways may be flooded after a heavy rain. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Fall plowing is beneficial to tillage operations performed the following spring.

Most areas of this soil are adequately drained and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation for farm use of this soil but can be overcome by subsurface drains, open ditches, surface drains, or a combination of these. Conservation tillage, crop residue management, and cover crops help to maintain tilth and organic matter content.

This soil is suited to grasses and legumes, but it is seldom used for pasture. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but few areas are wooded. Woodland management concerns are severe for plant competition, equipment use, seedling mortality, and windthrow hazard. Competing vegetation should be controlled by cutting, spraying, or girdling. Harvesting is often delayed until dry seasons or until the ground is frozen.

Ponding is a severe limitation for building site development of this Mahalasville soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, low strength, and frost action potential. Drainage ditches along roads lower the water table and prevent damage caused by frost action. The base for roads and streets should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. Alternate sites should be considered.

This Mahalasville soil is in capability subclass IIw and woodland suitability subclass 2w.

McA—Martinsville silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on low-lying stream terraces and glacial moraines. Mapped areas are irregular in shape and range from 3 to 35 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 48 inches thick. The upper part of the subsoil is dark yellowish brown, firm silty clay loam; the next part is brown, firm clay loam; the next part is reddish brown, firm sandy clay loam; and the lower part of the subsoil is strong brown and yellowish brown stratified sandy loam and loamy sand. The underlying material to a depth of about 75 inches is strong brown, mottled loamy sand. The solum that developed from silty material is as much as 28 inches thick in some areas. The subsoil contains as much as 15 percent gravel in a few places. The depth to firm till is less than 60 inches in a few profiles. In a few places the underlying material is sandy loam till.

Included with this soil in mapping are small areas of Starks and Whitaker soils in slight depressions. A few areas have slopes of more than 2 percent. Also included are small areas of Miami, Camden Variant, and Ockley soils. These inclusions make up about 15 percent of this map unit.

Permeability of this Martinsville soil is moderate. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay and pasture. A few small areas are wooded.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes, and very well suited to deep-rooted legumes. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on this soil. Foundations, footings, and basement walls should be properly designed, and subsurface drains should be installed to prevent structural damage caused by shrinking and swelling of the soil. This soil has moderate limitations for roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. This soil has slight limitations for septic tank absorption fields.

This Martinsville soil is in capability class I and woodland suitability subclass 1o.

McB2—Martinsville silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on low-lying stream terraces and glacial moraines. Mapped areas are irregular in shape and range from 3 to 35 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part of the subsoil is brown, firm clay loam; the next part is reddish brown, firm sandy clay loam; and the lower part of the subsoil is

yellowish brown and strong brown, friable loamy sand and sandy loam. The underlying material to a depth of 60 inches is strong brown and brown loamy sand, silt, and sand. The subsoil contains as much as 15 percent gravel in a few profiles. In some profiles loam till is at a depth of less than 60 inches. Similar soils which have less clay and more sand in the subsoil are on some of the low-lying stream terraces.

Included with this soil in mapping are small areas of Fincastle and Whitaker soils on flatter areas. Also included are areas that have a slope of more than 6 percent. Also included are small areas of Camden Variant, Miami, and Ockley soils. These inclusions make up about 15 percent of the map unit.

Permeability of this Martinsville soil is moderate. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff from cultivated areas is medium. The surface layer can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay and pasture. A few small areas are wooded.

This soil is suited to corn, soybeans, and small grain. Conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to control erosion if this soil is cultivated. Crop residue retained on the soil surface and cover crops also help to control erosion and maintain tilth and organic matter content.

Grasses and legumes for hay and pasture effectively control water erosion. Such deep-rooted legumes as alfalfa are well suited to this soil. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is well suited to trees, but few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by spraying, cutting, or girdling.

Shrink-swell potential is a moderate limitation for building site development on this soil. Foundations, footings, and basement walls should be properly designed, and subsurface drains should be installed to prevent structural damage caused by shrinking and swelling of the soil. This soil has moderate limitations for roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. This soil has slight limitations for septic tank absorption fields.

This Martinsville soil is in capability subclass IIe and woodland suitability subclass 1o.

MnC—Miami silt loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on upland knobs and breaks along streams and drainageways. Mapped areas range from 3 to 25 acres and are irregular in shape.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The subsoil is brown and dark yellowish brown, firm clay loam about 30 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In some places the subsoil is redder and contains more gravel. The combined surface layer and subsoil which developed from silty material is as much as 26 inches thick in some areas.

Included with this soil in mapping are areas of severely eroded soils that have a clay loam surface layer. These areas often have cobbles and gravel on the surface. Also included are small areas that have a slope of more than 12 percent. Small areas of Crosby soils along toe slopes and drainageways are also included. In some places in the northwest and north-central part of the county, the underlying till is friable. These inclusions make up about 10 to 15 percent of the map unit.

Permeability of this Miami soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is moderate. Surface runoff is medium. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for pasture, hay, and woodland. Some areas are farmed and used for corn, soybeans, and small grain.

This soil is suited to corn, soybeans, and small grain. However, the hazard of erosion is severe if this soil is cultivated. Crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures are needed to minimize soil erosion. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

Grasses and legumes for hay or pasture effectively control water erosion. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, and a few areas are in woodland. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, girdling, or spraying.

This Miami soil has moderate limitations for building site development because of moderate slope and shrink-swell potential. Foundations and basement walls should be properly designed to prevent structural damage from shrinking and swelling of this soil. Foundation drains are usually needed to remove excess water during wet seasons. Erosion is a hazard during construction. As much existing vegetation as possible should be retained. Topsoil should be stockpiled and promptly replaced after construction, and the exposed areas should be reseeded immediately. Diversions and grassed waterways between lots can divert excess runoff to suitable outlets.

This soil has moderate limitations for local roads and streets because of moderate slope, frost action potential, and low strength. The base for local roads and streets needs to be strengthened with suitable material, and roads and streets should follow the contour. The moderately slowly permeable underlying material is a severe limitation for septic tank absorption fields.

Lateral seepage above the firm till is common, and effluent may travel several feet before surfacing. Commercial sewers and treatment facilities are generally needed.

This Miami soil is in capability subclass IIIe and woodland suitability subclass 1o.

MnD—Miami silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on breaks along streams and drainageways of uplands. Mapped areas are elongated or irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is dark yellowish brown and yellowish brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of 60 inches is yellowish brown loam. Some profiles have a gravelly subsoil, and some have sandy loam, loamy sand, or sandy clay loam layers in the subsoil. In the northwestern and north-central part of the county the underlying till is more friable. The combined surface layer and subsoil is less than 24 inches thick in some areas.

Included with this soil in mapping are severely eroded areas, most of which have a gravelly surface. Also included are small areas that have slopes of more than 18 percent. These inclusions make up about 15 percent of this map unit.

Permeability of this Miami soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is moderate. Surface runoff is rapid. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for pasture, hay, or woodland. A few areas are farmed and used for corn, soybeans, and small grain.

This soil is not suited to corn, soybeans, and small grain because of the severe hazard of erosion. Conservation tillage, diversions, grassed waterways, and proper use of crop residue help to control erosion if this soil is cultivated.

Grasses and legumes for hay or pasture effectively control water erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, and many areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, girdling, or spraying.

This Miami soil is severely limited for building site development because of strong slope. If it is used as building sites, as much existing vegetation as possible needs to be conserved, and the exposed areas should be reseeded or sodded immediately. There is some hazard in operating certain machinery on cross slopes. Foundations, footings, and basement walls need to be properly designed, and foundation drains should be used to remove excess water during wet seasons.

This soil has a severe limitation for local roads and streets because of strong slope. Local roads and streets should be on the contour, and their base should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of strong slope and moderately slow permeability. Lateral seepage along the top of the firm till usually occurs, and the effluent may travel several feet before surfacing. Septic systems should be adapted to the slope of the land. Commercial sewers are often needed.

This Miami soil is in capability subclass IVe and woodland suitability subclass 1o.

MsC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on upland knobs and breaks along drainageways and streams. Mapped areas are long and narrow or irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is yellowish brown, firm clay loam about 8 inches thick. The subsoil is yellowish brown, firm clay loam about 20 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. Some profiles have layers of sandy clay loam, gravelly clay loam, sandy loam, loamy sand, and sand in the lower part of the subsoil. In a few of the most severely eroded areas, calcareous till is at the surface. The underlying till is more friable in the northwestern and north-central parts of the county.

Included with this soil in mapping are a few small areas of Crosby soils along toe slopes and drainageways. Some areas have a slope of more than 12 percent or less than 6 percent. These inclusions make up about 15 percent of this map unit.

Permeability of this Miami soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is low. Surface runoff is medium. The surface layer is difficult to till and becomes cloddy if tilled when wet. The surface layer ranges from strongly acid to neutral depending on past liming practices and the severity of erosion.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay or pasture.

This soil is poorly suited to corn and soybeans because of the severely eroded surface layer and the

severe hazard of further erosion. Some areas have small gullies that are difficult for farm machinery to cross. Small grain can be grown so that stands of grasses and legumes can be reestablished. Conservation tillage, diversions, grassed waterways, and proper use of crop residue help to prevent excessive soil loss. Crop rotations that include grasses and legumes most of the time effectively control erosion.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the soil and pasture in good condition.

This soil is suited to trees. Several areas have poor stands of young trees. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling. Because of the severely eroded surface layer, the seedling survival rate is not as high as in uneroded areas.

This soil has moderate limitations for building sites because of the steepness of the slope and shrink-swell potential. Foundations and basement walls should be properly designed to prevent damage from shrinking and swelling. Foundation drains are usually needed to remove excess water during wet seasons. Erosion is a hazard during construction. As much existing vegetation as possible should be retained. Topsoil needs to be stockpiled and promptly replaced after construction, and the exposed areas should be reseeded immediately. Diversions and waterways between lots can divert excess runoff to suitable outlets.

This soil has moderate limitations for local roads and streets because of low support strength, frost action potential, and moderate slope. The base for local roads and streets needs to be strengthened with suitable material. Local roads and streets should follow the contour. This soil has a severe limitation for septic tank absorption fields because of moderately slow permeability. Lateral seepage along the top of the firm till generally occurs, and effluent may travel several feet before surfacing. Septic systems should be adapted to the slope. Commercial sewers and treatment facilities are usually needed.

This Miami soil is in capability subclass IVe and woodland suitability subclass 1o.

MsD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on breaks along streams and drainageways. Mapped areas range from 3 to 15 acres and are irregular in shape.

In a typical profile, the surface layer is dark brown clay loam about 6 inches thick. The subsoil is dark yellowish brown, firm clay loam about 22 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer is calcareous. The surface layer is gravelly in some areas. The subsoil is gravelly loam or gravelly clay loam in places.

Included with this soil in mapping are areas that have slope of more than 18 percent. Small areas of Hennepin soils are also included. The underlying till is more friable in the northwestern and north-central parts of the county. These inclusions make up about 15 to 20 percent of this map unit.

Permeability of this Miami soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is low. Surface runoff is very rapid. The surface layer becomes very cloddy and hard to work if tilled when wet because of poor soil structure and absence of organic matter. Seed germination is slow in this soil.

Some areas of this soil are farmed, but many areas are idle. The vegetation is briars and young trees. Other areas are used for hay or pasture.

This soil is poorly suited to corn and soybeans because of the severely eroded surface layer and the severe hazard of further erosion. Some areas have gullies that are difficult for farm machinery to cross. Small grain is grown so that stands of grasses and legumes can be reestablished. Conservation tillage, diversions, grassed waterways, and proper use of crop residue help to prevent excessive soil loss. Crop rotations that include grasses and legumes most of the time effectively control erosion.

This soil is suited to grasses and legumes for forage and pasture. Areas should be left in grass because of the difficulty in establishing seedings in the severely eroded surface layer. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the soil and pasture in good condition.

This soil is suited to trees. Several areas have poor stands of young trees. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, girdling, or spraying. Because of the severely eroded surface layer, seedling survival is not as good as in uneroded areas.

This Miami soil has a severe limitation for building site development because of the steepness of the slope. When used as building sites, as much existing vegetation as possible should be conserved, and exposed areas should be reseeded or sodded immediately. There is some hazard in operating certain types of machinery on cross slopes. Foundations, footings, and basement walls should be properly designed, and foundation drains should be used to remove the excess water that collects during wet seasons.

This soil has a severe limitation for local roads and streets because of steepness of the slope. Local roads and streets should be on the contour, and their base should be strengthened with suitable material. This soil

has severe limitations for septic tank absorption fields because of strong slope and moderately slow permeability. Lateral seepage generally occurs, and the effluent may travel several feet before surfacing. Commercial sewers and treatment facilities are generally needed.

This Miami soil is in capability subclass VIe and woodland suitability subclass 1o.

MtB—Miami-Crosby silt loams, 2 to 6 percent slopes. These gently sloping, deep soils are on undulating till plains and slopes adjacent to drainageways. The Miami soil is well drained, and the Crosby soil is somewhat poorly drained. Mapped areas are broad and irregular in shape and range from 3 to 300 acres. This complex is about 55 percent Miami soil and 25 percent Crosby soil. The Miami soil is on knolls, side slopes, and ridgetops. The Crosby soil is on toe slopes, along drainageways, and in swales. These soils are so intricately mixed or in such small areas that it was not practical to separate them in mapping.

In a typical profile of Miami soil, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is dark yellowish brown and yellowish brown, firm clay loam; and the lower part is yellowish brown, firm loam. The underlying material to a depth of 60 inches is brown loam. The surface layer and subsoil are more than 40 inches thick in many areas. In some profiles the lower part of the subsoil is gravelly.

In a typical profile of Crosby soil, the surface layer is brown silt loam about 8 inches thick. The subsoil is yellowish brown and mottled and is about 32 inches thick. The upper part of the subsoil is firm silty clay loam, and the lower part is firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In some profiles the silty clay loam horizon is as much as 30 inches thick. The lower part of the subsoil is stratified silt loam, sandy loam, and sand as much as 12 inches thick in some profiles. The surface layer and subsoil are less than 24 inches thick in some areas.

Included with these soils in mapping are small areas of Treaty, Fincastle, Whitaker, and Xenia soils. Also included are small areas of Miami soils that have a slope of more than 6 percent and some areas of Crosby soils that have a slope of less than 2 percent. Some areas of Miami soils that are severely eroded and have a clay loam surface layer are included. These inclusions make up about 5 to 25 percent of each mapped area.

Permeability of the Miami soil is moderate in the subsoil and moderately slow in the underlying material. The Crosby soil is slowly permeable. In the northwest and north-central parts of the county, the underlying material of both soils is more friable and is moderately permeable. The available water capacity is moderate for the Miami soil and high for the Crosby soil. The organic matter content in the surface layer is moderate for both soils. A seasonal high water table is at a depth of 1 foot to 3 feet during the winter and early in spring in the Crosby soil. Surface runoff is medium. The soils in this complex have a surface layer that is fairly easy to till throughout a fairly wide range in moisture content. The severely eroded areas included in this complex are difficult to till.

Most areas of these soils are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, woodland, or truck crops.

The soils in this complex are suited to corn, soybeans, and small grain. Crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures help to prevent erosion if this soil is cultivated. Crop residue retained on the surface and cover crops also help to control erosion and improve and maintain tilth and organic matter content. Subsurface drains are needed in some areas of drainageways and swales that are wet because of seepage. The side slopes are difficult to farm in the spring because of lateral seepage of water above the firm till.

Grasses and legumes for hay or pasture effectively reduce surface runoff and erosion. If these soils are used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

The soils of this complex are suited to trees, and some areas are in woodland. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on the Miami soil. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling. Foundation drains are needed to remove excess water during wet seasons. This Miami soil has moderate limitations for local roads and streets because of frost action potential and low support strength. The base for local roads and streets needs to be strengthened with suitable material. Use of this soil for septic tank absorption fields is severely limited because of moderately slow permeability. Lateral seepage along the top of the till generally occurs, and effluent can travel several feet before surfacing.

Wetness is a severe limitation for building site development on the Crosby soil. Areas used for building sites should be drained. Dwellings and small buildings should be constructed without basements. This Crosby soil has severe limitations for local roads and streets because of low support strength and frost action potential. Drainage ditches along roads help to prevent frost action damage. The base for roads needs to be strengthened with suitable material. Wetness and slow permeability are severe limitations for septic tank absorption fields. Perimeter tile drainage helps to lower

the seasonal high water table, but commercial sewers and treatment facilities are generally needed.

Onsite investigation is often needed to determine the limitations of these soils for building sites and local roads and streets.

These soils are in capability subclass IIe. The Miami soil is in woodland suitability subclass 1o, and the Crosby soil is in woodland suitability subclass 3o.

MwA—Miami-Martinsville silt loams, 0 to 2 percent slopes. These nearly level, deep, well drained soils are on rises on till plains. Mapped areas are irregular in shape and range from 3 to 30 acres. This complex contains about 55 percent Miami soil and 30 percent Martinsville soil. These soils are so intricately mixed that they could not be separated in mapping.

In a typical profile of Miami soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 32 inches thick. The upper part is dark yellowish brown, firm silty clay loam; and the lower part is dark yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, firm loam.

In a typical profile of Martinsville soil, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 40 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the next part is brown, firm clay loam; and the lower part of the subsoil is dark brown, firm sandy clay loam. The underlying material to a depth of 60 inches is strong brown and dark yellowish brown silt loam and loamy sand. In some areas the horizons developed from silty material are as much as 24 inches thick. In some areas the underlying material is thin and loam till is as shallow as 50 inches. In other areas the substratum is sand and coarse sand.

Included with the Miami and Martinsville soils in mapping are small areas of Camden, Russell, Xenia, and Fincastle soils. These inclusions make up about 15 percent of the complex.

The Martinsville soil is moderately permeable. Permeability in the Miami soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of these soils are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, woodland, or truck crops.

These soils are suited to corn, soybeans, small grain, and truck crops. Conservation tillage and crop residue management help to maintain tilth and organic matter content.

These soils are suited to grasses or legumes. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

These soils are suited to trees, and a few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on these soils. Foundations, footings, and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. Foundation drains should be installed. These soils have moderate limitations for local roads and streets because of frost action potential and low support strength. The road base should be strengthened with suitable material. The Miami soil has a severe limitation for septic tank absorption fields because of moderately slow permeability. The Martinsville soil has slight limitations for septic tank absorption fields.

Onsite investigation is needed to determine the limitations of this complex for septic tank absorption fields.

The soils of this complex are in capability class I and woodland suitability subclass 1o.

Mx—Milford silty clay loam. This nearly level, deep, very poorly drained soil is in potholes on lakebeds and till plains and along drainageways. It is ponded by runoff from adjacent areas. Mapped areas are mostly oval, but several are elongated and parallel drainageways. Areas range from 3 to 50 acres.

In a typical profile, the black surface soil is about 17 inches thick. It is silty clay loam in the upper part and silty clay in the lower part. The subsoil is about 21 inches thick. The upper part of the subsoil is very dark gray and gray, mottled, firm silty clay; and the lower part is gray, mottled, firm silt loam containing thin strata of silty clay loam. The underlying material to a depth of 60 inches is gray, mottled silt loam containing thin strata of silty clay loam. Loose sand and gravel is between depths of 40 and 80 inches in several profiles. Some areas have a dark surface layer as much as 26 inches thick.

Included with this soil in mapping are small areas of Cyclone, Patton, and Mahalasville soils on slightly higher-lying positions. Also included are small convex areas of Starks and Whitaker soils. Small areas that stay wet for extended periods and are usually not farmed are included. Some areas have a mucky surface layer. These inclusions make up about 10 percent of this map unit.

Permeability of this Milford soil is slow in the subsoil and moderately slow in the underlying material. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow to ponded. A seasonal high water table is near or above the surface in winter and spring. The surface layer can be tilled only through a very narrow range in moisture content without becoming cloddy and hard. In areas that have silty overwash, the surface layer is easier to till. Fall chiseling or plowing is beneficial to tillage operations performed the following spring.

Most areas of this soil are adequately drained and used for corn, soybeans, and small grain. Undrained or inadequately drained areas are used for pasture and woodland, or are idle.

This soil is suited to corn and soybeans. Wetness is the major limitation for farm use of this soil. Most areas that are adequately drained for row crops are not suitable for small grain because of ponding in winter and spring. Subsurface drains, open ditches, surface drains, or a combination of these can drain this soil, but in many cases there is no suitable outlet. Surface drains are generally necessary to remove surface water because the subsoil restricts downward movement of water to tile. If surface drains are not feasible, surface inlet risers can be used with the tile system. In large areas, pumping stations may be justified. With drainage and proper management, this soil is suited to intensive row crops. Conservation tillage, crop residue management, and cover crops help to maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture, although these may be damaged by ponded water in winter and spring. Overgrazing or grazing when the soil is wet results in surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil, and a few undrained areas are wooded. Woodland management concerns are severe for equipment use, seedling mortality, and windthrow hazard. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling. Harvesting is often delayed until the ground is frozen or until dry seasons.

This Milford soil has severe limitations for building site development because of shrink-swell potential and ponding. Areas used as building sites should be artificially drained and protected from ponding. Dwellings and small buildings should be constructed without basements. Foundations and footings should be designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has severe limitations for local roads and streets because of ponding and low support strength. Drainage ditches are needed along roads to lower the water table. The base for roads should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. Commercial sewers and treatment facilities are generally needed.

This Milford soil is in capability subclass IIw and woodland suitability subclass 2w.

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on stream terraces and small morainal rises on uplands. Mapped areas on stream terraces are mostly elongated and parallel streams. Upland areas are irregular in shape or oval. Areas range from 3 to 40 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 10 inches thick. The subsoil is about 48 inches thick. The upper part of the subsoil is dark yellowish brown, firm silty clay loam; the next part is dark brown, firm clay loam and gravelly clay loam; and the lower part of the subsoil is reddish brown, firm gravelly sandy clay loam. The underlying material to a depth of 70 inches is brown very gravelly coarse sand. In places loam till is within a depth of 55 inches. In some areas the lower part of the subsoil is sandy loam or loamy sand. Thickness of the sand and gravel ranges from less than 1 foot to more than 15 feet along Wildcat Creek in the western part of the county.

Included with this soil in mapping are a few small, slightly lower-lying areas of Sleeth soils. Also included are small areas that have a slope of more than 2 percent and shallow soils on steep breaks along major streams. Small areas of Camden Variant and Martinsville soils are also included. Also included on low-lying stream terraces are soils which have loose sand and gravelly sand at a depth of less than 42 inches. These inclusions make up about 15 percent of the map unit.

Permeability of this Ockley soil is moderate in the subsoil and very rapid in the underlying material. The available water capacity is high and the organic matter content in the surface layer is moderate. Surface runoff is slow. The friable surface layer can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay and pasture. A few areas are wooded. Some areas are a source of sand and gravel.

This soil is suited to corn, soybeans, and small grain. Fall seeded crops are well suited to this soil. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is well suited to grasses and legumes and very well suited to deep-rooted legumes. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

This soil has a moderate limitation for building site development because of shrink-swell potential. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has a severe limitation for local roads and streets because of low support strength. The base for roads and streets should be strengthened with suitable material. This soil has slight limitations for septic tank absorption fields.

This Ockley soil is in capability class I and woodland suitability subclass 1o.

OcB—Ockley silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on stream terraces and small morainal rises on uplands. Mapped areas on stream terraces are mostly elongated and parallel streams. Upland areas are irregular in shape or oval. Areas range from 3 to 40 acres.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 46 inches thick. The upper part of the subsoil is brown, friable or firm silt loam and silty clay loam; the next part is dark brown, firm clay loam and gravelly clay loam; and the lower part is reddish brown and dark reddish brown, firm gravelly sandy clay loam. The underlying material to a depth of 60 inches is brown very gravelly coarse sand. Loam till is within a depth of 55 inches in some areas. Thickness of the underlying sand and gravelly sand ranges from less than 1 foot to more than 15 feet along Wildcat Creek in the western part of the county.

Included with this soil in mapping are a few small areas of Sleeth soils; Fox soils that have a slope of more than 6 percent; small, severely eroded areas; shallow soils on steep breaks; and small areas of Miami soils. These inclusions make up about 10 to 15 percent of the map unit.

Permeability of this Ockley soil is moderate in the subsoil and very rapid in the underlying material. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is medium. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay and pasture. A few gravel and sand pits are located in areas of this soil.

This soil is suited to corn, soybeans, and small grain. Crop rotation, conservation tillage, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures help to prevent excessive soil loss if this soil is cultivated. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

Grasses and legumes for hay and pasture effectively control erosion. Such deep-rooted legumes as alfalfa are well suited to this soil. Proper stocking rates, pasture rotation, and timely grazing help to maintain the pasture and soil.

This soil is suited to trees, but few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

This soil has a moderate limitation for building site development because of shrink-swell potential. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has a severe limitation for local roads and streets because of low support strength. The base for local roads and streets should be strengthened with suitable material. This soil has slight limitations for septic tank absorption fields.

This Ockley soil is in capability subclass IIe and woodland suitability subclass 1o.

Pc—Palms muck, undrained. This nearly level, deep, very poorly drained soil is on flood plains and in potholes on terraces and uplands. It is ponded by runoff from surrounding areas, and a few areas on the flood plains are occasionally flooded. Flood plain areas are elongated and parallel streams. They range from 3 to 100 acres. Upland and terrace areas are oval and are in potholes that are generally less than 10 acres.

In a typical profile, the surface layer is black muck about 12 inches thick. The subsurface tier is very dark gray, friable muck about 14 inches thick. The underlying material to a depth of 60 inches is dark gray silt loam and loam. In some areas the surface layer is mucky silt loam. In a few profiles the organic material is as thin as 12 inches.

Included with this soil in mapping are areas of Patton, Saranac, and Sloan soils. A few areas where loose sand is at the surface are included. Small areas of Houghton soil are also included. Some profiles have thin layers of coprogenous earth below the muck. These inclusions make up about 20 percent of this map unit.

Permeability of this Palms soil is moderately rapid in the organic layers and moderate or moderately slow in the mineral material. The available water capacity is high. The organic matter content of the surface layer is very high. A seasonal high water table is near or above the surface in winter and spring. The surface layer is easy to till throughout a wide range in moisture content.

Most areas of this soil are not cultivated because of wetness. The dominant vegetation is wetland weeds and shrubs. A few areas are used for pasture or remain wooded. Some areas are used for corn and soybeans.

This soil is generally not suited to corn and soybeans unless adequately drained by subsurface drains, surface drains, or open ditches. Generally a combination of these is used. Pumping stations are needed in the lowest lying areas. Subsidence is often a problem in the organic part of the soil after drainage has been established. Wetness is the major limitation and flooding is the major hazard for farm use of this soil. Fall-seeded and early spring-seeded small grain can be damaged by ponded water even where satisfactory drainage has been established for row crops.

Quality grasses and legumes do not grow on this soil unless adequate drainage has been established. Surface ponding is a hazard for grasses and legumes in winter and early in spring. The major concern for pasture management is overgrazing and grazing when the soil is wet. Proper stocking rates and timely grazing help to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil, but few areas are wooded. Woodland management concerns are severe for equipment use, windthrow hazard, and

seedling mortality. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling. Trees can be harvested only in dry seasons or when the ground is frozen.

This soil has severe limitations for building site development, local roads and streets, and septic tank absorption fields, and is generally unsuited for these uses because of low support strength and ponding. Alternate sites should be considered. Removing the organic material and replacing it with suitable base material and installing drainage ditches will help local roads and streets hold up.

This Palms soil is in capability subclass Vw and woodland suitability subclass 4w.

PgB—Parr silt loam, 1 to 5 percent slopes. This gently sloping, deep, well drained soil is on knobs and sloping areas along drainageways and streams. Mapped areas are irregular in shape and range from 3 to 80 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsoil is firm clay loam about 27 inches thick. The upper part of the subsoil is dark yellowish brown and dark brown, and the lower part is yellowish brown and strong brown. The substratum to a depth of 60 inches is yellowish brown loam till. Some profiles have horizons of sandy clay loam, loamy sand, and sand in the lower part of the subsoil. In some profiles the silty horizons are as much as 24 inches thick and the solum is thicker.

Included with this soil in mapping are small eroded areas that have a surface layer less than 10 inches thick. Also included are Dana soils on flatter areas. Raub soils are included in lower lying areas. Where this soil is near Miami and Fincastle soils, it has a dark surface layer between 6 and 10 inches thick even in noneroded areas. These inclusions make up about 15 percent of the map unit.

Permeability of this Parr soil is moderate in the subsoil and moderately slow in the underlying material. The available water capacity is moderate. The organic matter content of the surface layer is high. Surface runoff is medium. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and are used for corn, soybeans, and small grain. Some areas are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. Crop rotation, conservation tillage, diversions, contour farming, grassed waterways, or grade stabilization structures help to prevent excessive soil loss. Crop residue retained on the surface and cover crops also help to control erosion and improve and maintain tilth and organic matter content. Areas in some of the drainageways and swales that are wet because of seepage need subsurface drains.

Grasses and legumes for hay or pasture effectively control erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

Shrink-swell potential is a moderate limitation for building site development on this Parr soil. Foundations, footings, and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has a severe limitation for local roads and streets because of low support strength. The base for roads and streets should be strengthened with suitable material. This soil has a severe limitation for septic tank absorption fields because of moderately slow permeability. Lateral seepage along the top of the firm till generally occurs, and the effluent can travel several feet before surfacing.

This Parr soil is in capability subclass IIe and is not assigned to a woodland suitability subclass.

Pn—Patton silty clay loam. This nearly level, deep, poorly drained soil is in depressions and potholes on till plains, lakebeds, and along drainageways. It is ponded by runoff from adjacent areas. Most mapped areas are oval, but some areas in drainageways are elongated. Areas range from 3 to 40 acres.

In a typical profile, the upper part of the surface layer is black silty clay loam about 9 inches thick, and the lower part is very dark gray silty clay loam about 3 inches thick. The subsoil is gray, mottled, firm silty clay loam about 18 inches thick. The underlying material to a depth of 60 inches is gray, mottled silt loam. Light colored material has washed in over the original black surface layer in some areas. The dark surface layer is as much as 24 inches thick in some areas.

Included with this soil in mapping are small, slightly elevated areas of Crosby, Starks, and Whitaker soils. A few areas of this soil have a calcareous surface layer. A few profiles have a mucky surface layer. Undrained areas that stay wet for extended periods are also included. Small areas of Milford, Mahalasville, and Westland soils are also included. These inclusions make up about 10 percent of this map unit.

Permeability of this Patton soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow to ponded. A seasonal high water table is near or above the surface in spring. The surface layer can be tilled only throughout a narrow range in moisture content without becoming cloddy and hard. Chiseling or plowing in the fall is beneficial to tillage operations performed the following spring.

Most areas of this soil are farmed, and adequate drainage has been established. Drained areas are used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodlots. Some undrained areas are idle, and wetland weeds are the dominant vegetation.

This soil is suited to corn and soybeans where adequate drainage has been established. Wetness is a

major limitation, but subsurface drains, open ditches, surface drains, or a combination of these can be used to drain this soil. Suitable outlets are difficult to find because this soil is in low-lying potholes. Surface drains are often necessary to remove surface water because the subsoil restricts downward movement of water to subsurface drains. If sufficient grade is not present, surface inlet risers can help to drain these potholes. Most areas that are adequately drained for row crops are not suitable for small grain because of ponding in winter and spring. If drained and properly managed, this soil is suited to intensive row crops. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes for hay or pasture if adequately drained. Grasses and legumes may be damaged by ponded water. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates and timely grazing help to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil, and a few undrained areas are wooded. Woodland management concerns are severe for equipment use and plant competition. Seedling mortality and windthrow hazard are moderate. Water-tolerant trees should be favored in timber stands. Competing vegetation should be controlled by cutting, spraying, and girdling. Harvesting may be delayed until dry seasons or until the ground is frozen.

Ponding is a severe limitation for building site development on this Patton soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, frost action potential, and low support strength. Drainage ditches along roads can lower the water table and prevent damage caused by frost action. The base for roads should be strengthened with suitable material. Ponding is a severe limitation for septic tank absorption fields on this soil. Commercial sewers and treatment facilities are generally needed.

This Patton soil is in capability subclass IIw and woodland suitability subclass 2w.

Pr—Pits, gravel. These nearly level to steep, well drained areas are gravel pits. Gravel pits are on uplands, terraces, and flood plains. One large pit is located north of Jefferson. Pits range from 5 to about 60 acres.

In a typical area, the soil material has been removed, and sand and gravel is exposed. In places soil material has washed into pits, and sparse vegetation is growing.

Included in this map unit are small areas where the overburden has been piled. These areas are covered by vegetation. Included in the uplands are small abandoned pits where the gravel has been removed and glacial till is exposed. Also included are many areas of water in the lowest part of the pits. These inclusions make up 40 percent of the map unit.

Permeability of the material is rapid or very rapid, except in areas where glacial till is exposed. The till has moderately slow permeability. The available water capacity of this material is very low. The organic matter content is low. Reaction ranges from slightly acid to moderately alkaline. Most of the sand and gravel is calcareous.

Most areas of this map unit are barren. Erosion is a hazard.

Onsite investigation is needed if areas of this map unit are to be used for building site development, sanitary facilities, or roads and streets. Properties of these areas are variable.

This miscellaneous area is not assigned to a capability subclass or woodland suitability subclass.

PtA—Proctor silt loam, 0 to 3 percent slopes. This nearly level, deep, moderately well drained soil is on outwash plains and lake plains. Mapped areas are irregular in shape and range from 3 to 30 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 54 inches thick. The upper part of the subsoil is dark brown, friable silt loam; the next part is dark yellowish brown, firm silty clay loam; the next part is yellowish brown, mottled, firm clay loam; and the lower part of the subsoil is yellowish brown, mottled, friable loam. The underlying material to a depth of 70 inches is strong brown, stratified loamy sand and sand. Some profiles do not have mottles within a depth of 30 inches.

Included with this soil in mapping are soils that have less silt and more sand in the subsoil. Also included are Raub and Brenton soils. The slope is more than 3 percent in a few areas, and some of these areas are eroded. These inclusions make up about 5 to 10 percent of the map unit.

Permeability of this Proctor soil is moderate in the subsoil and moderately rapid in the underlying material. The available water capacity is high. The organic matter content of the surface layer is high. A seasonal high water table is at a depth of 2.5 to 6 feet in winter and early in spring. Surface runoff is slow. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. Some areas are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This Proctor soil has moderate limitations for building site development because of wetness and shrink-swell

potential. Foundations, footings, and basement walls should be properly designed and drainage tile should be installed to help prevent structural damage caused by shrinking and swelling of the soil and wetness. This soil has severe limitations for roads and streets because of frost action potential and low support strength. The base for roads needs to be strengthened with suitable material. Wetness is a severe limitation for septic tank absorption fields on this soil. Perimeter tile can lower the water table.

This Proctor soil is in capability class I and is not assigned to a woodland suitability subclass.

Ra—Ragsdale silt loam. This nearly level, deep, very poorly drained soil is in depressions and on broad level flats on uplands. This soil is ponded by runoff from adjacent areas. Most areas are oval, but some are irregular in shape. Mapped areas range from 3 to 500 acres.

In a typical profile, the upper part of the surface layer is very dark gray silt loam about 8 inches thick, and the lower part is black silty clay loam about 6 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is dark gray, firm silty clay loam; the next part is grayish brown, mottled, firm silty clay loam; and the lower part of the subsoil is light brownish gray, mottled, friable silt loam. The underlying material to a depth of 60 inches is light brownish gray silt loam. There are thin layers of sandy loam, loamy sand, or sand in the underlying silty material below a depth of 50 inches in some profiles. Light colored soil has washed upon the original surface layer in some profiles.

Included with this soil in mapping are small convex areas of Fincastle, Reesville, and Starks soils and small areas of Cyclone and Patton soils. These inclusions make up about 15 to 20 percent of this map unit.

Permeability of this Ragsdale soil is slow. The available water capacity is high. The organic matter content in the surface layer is high. Surface runoff is ponded or very slow. A seasonal high water table is near or above the surface in winter and spring. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Chiseling or plowing in the fall is often beneficial to tillage operations performed the next spring.

Most areas of this soil are drained by subsurface drains and open ditches and used for corn and soybeans. Surface drains are used in some areas. A few areas are wooded.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil, and a few undrained areas are wooded. Woodland management concerns are severe for equipment use, seedling mortality, windthrow hazard, and plant competition. Harvesting is often delayed until dry seasons or until the ground is frozen. Water-tolerant trees are favored in timber stands. Competing vegetation should be controlled by cutting, spraying, and girdling.

Ponding is a severe limitation for building site development on this Ragsdale soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, low support strength, and frost action potential. Drainage ditches along roads lower the water table and prevent damage caused by frost action. The base for roads should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of ponding and slow permeability. Commercial sewers and treatment facilities are generally needed.

This Ragsdale soil is in capability subclass IIw and woodland suitability subclass 2w.

RdA—Raub silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on slight rises on broad till plains. Mapped areas are irregular in shape and range from 3 to 300 acres.

In a typical profile, the surface layer is very dark brown silt loam about 11 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam; the next part is light olive brown, mottled, firm silty clay loam; and the lower part of the subsoil is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. Strata of loam, loamy sand, or sandy loam as much as 10 inches thick are in the lower part of the subsoil in places. In places the underlying loam till is within a depth of 30 inches.

Included with this soil in mapping are slightly elevated areas of Dana and Parr soils; Drummer and Mahalasville soils in depressions; and Brenton soils. These inclusions make up about 15 percent of the map unit.

Permeability of this Raub soil is moderately slow. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 3 feet in winter and early in spring. The surface layer is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are drained by subsurface drains and open ditches and are used for corn, soybeans, and small grain. Some areas are used for hay or pasture

This soil is well suited to corn, soybeans, and small grain. Conservation tillage and crop residue management help to maintain organic matter and good tilth.

This soil is suited to grasses and legumes for hay or pasture if adequately drained. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help maintain good tilth and plant density.

Wetness is a severe limitation for building site development on this soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for roads and streets because of frost action potential and low support strength. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of wetness and slow permeability. Tile laid on the perimeter helps lower the water table, but commercial sewers and treatment facilities are generally needed.

This Raub soil is in capability subclass IIw and is not assigned to a woodland suitability subclass.

Re—Reesville silt loam. This nearly level, deep, somewhat poorly drained soil is on broad till plains. Mapped areas are irregular in shape and range from 3 to 300 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 2 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is grayish brown, mottled, firm silt loam; the next part is yellowish brown and light olive brown, mottled, firm silty clay loam; and the lower part of the subsoil is light olive brown, mottled, friable silt loam. The underlying material to a depth of 60 inches is light olive brown, mottled silt loam. Small areas of a similar soil that is better drained are on slightly higher rises. The subsoil below a depth of 40 inches developed in loam till or loamy sediment in some areas.

Included with this soil in mapping are small areas of Mahalasville, Ragsdale, Starks, and Fincastle soils. Small areas that have 8 to 20 inches of loamy sand at the surface are included. These inclusions make up about 15 percent of this map unit.

Permeability of this Reesville soil is moderate. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 2 feet in winter and early in spring. This soil has a friable surface layer that is easily tilled throughout a fairly wide range in moisture content.

Adequate drainage has been established in most areas of this soil through subsurface tile and open ditches. Most areas are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

Some undrained areas can grow grasses and legumes, but drainage is generally beneficial. Such deep-rooted legumes as alfalfa are well suited to this soil. Grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to reduce surface compaction and maintain good tilth and plant density.

This soil is suited to trees, but it is seldom used for that purpose. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation for building site development on this Reesville soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads should be strengthened with suitable material. This soil is severely limited for septic tank absorption fields because of wetness. Perimeter tile will help to lower the water table.

This Reesville soil is in capability subclass IIw and woodland suitability subclass 2o.

RuB—Russell silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on slight rises and side slopes paralleling drainageways on till plains. Mapped areas are irregular in shape and range from 3 to 30 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 60 inches thick. The upper part of the subsoil is yellowish brown friable silt loam; the next part is dark yellowish brown, firm silty clay loam and clay loam; and the lower part of the subsoil is brown, firm clay loam. In places the upper part of the subsoil contains more sand and less silt. The lower part of the subsoil is stratified sandy loam, sandy clay loam, and loam in some areas.

Included with this soil in mapping are small areas of Miami and Xenia soils. Also included are small, severely eroded areas; areas that have slope of more than 6 percent; and somewhat poorly drained soils in drainageways. These inclusions make up about 20 percent of the map unit.

Permeability of this Russell soil is moderate. The available water capacity is high. The organic matter content in the surface layer is moderate. Surface runoff is medium. The friable surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or truck crops. A few areas are wooded.

This soil is suited to corn, soybeans, small grain, and truck crops. With proper management, this soil is suited to intensive row crops. Conservation tillage, crop residue

management, contour farming, grassed waterways, grade stabilization structures, terraces, and diversions help to control erosion and maintain organic matter content and tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for woodlots. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Shrink-swell potential is a moderate limitation for building site development on this soil. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. The base for local roads and streets should be strengthened with suitable material. Permeability is a moderate limitation for septic tank absorption fields on this soil. Enlarging the filter field can help to overcome this limitation.

This Russell soil is in capability subclass IIe and woodland suitability subclass 1o.

Sa—Sable silty clay loam. This nearly level, deep, poorly drained soil is in depressions on broad till plains. This soil is ponded by runoff from adjacent areas. Most mapped areas are oval and range from 3 to 40 acres.

In a typical profile, the surface soil is black silty clay loam about 16 inches thick. The subsoil is mottled, firm silty clay loam about 32 inches thick. The upper part of the subsoil is gray, the next part is light gray, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is gray silt loam. The surface soil is as much as 24 inches thick where overwash has accumulated. The underlying material has thin lenses of sand below a depth of 60 inches in a few profiles.

Permeability of this Sable soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is ponded or very slow. A seasonal high water table is near or above the surface in winter and spring. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Fall plowing is beneficial to tillage operations performed the next spring.

Most areas of this soil are drained by subsurface drains and open ditches and are used for corn and soybeans. Surface drains are used in some areas.

This soil is well suited to corn, soybeans, and small grain. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing keep the pasture and soil in good condition.

Ponding is a severe limitation for building site development on this soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, low support strength, and frost action potential. Drainage ditches along roads lower the water table and help prevent damage caused by frost action. The base for roads should be strengthened with suitable material. Ponding is a severe limitation for septic tank absorption fields on this soil. Commercial sewers and treatment facilities are usually needed.

This Sable soil is in capability subclass IIw and is not assigned to a woodland suitability subclass.

Sc—Sable-Drummer silty clay loams. These nearly level, deep, poorly drained soils are on broad, level till plains. Parts of this complex are ponded by runoff from adjacent areas. Mapped areas are mostly oval and range from 40 to 500 acres. This complex is about 40 percent Drummer soil and 40 percent Sable soil. Drummer soil is usually near the edges of the map unit or on higher-lying landforms. Sable soil is usually on lower-lying parts of the map unit. These soils are so intricately mixed that it was not possible to separate them in mapping.

In a typical profile of Sable soil, the surface soil is black silty clay loam about 14 inches thick. The subsoil is about 39 inches thick. The upper part of the subsoil is gray and grayish brown, mottled, firm silty clay loam; and the lower part is grayish brown, mottled, firm silt loam. The underlying material to a depth of 60 inches is grayish brown, mottled, stratified silt loam, sand, and fine sand. In places the underlying material is thin and loam till is within a depth of 65 inches.

In a typical profile of Drummer soil, the surface layer is black silty clay loam about 14 inches thick. The subsoil is about 48 inches thick. The upper part of the subsoil is very dark gray and gray, mottled, firm silty clay loam, and the lower part is yellowish brown, mottled, firm silt loam and loam. The underlying material is gray mottled loam.

Included in this complex are small areas of Treaty and Patton soils in depressions, and Starks, Fincastle, and Crosby soils on slight rises. The inclusions make up about 15 to 20 percent of the complex.

Permeability of the Sable and Drummer soils is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is slow. A seasonal high water table is near or above the surface in winter and early in spring. These soils have a surface layer which can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Chiseling or plowing in the

fall is beneficial to tillage operations performed the following spring.

Practically all areas of these soils are drained and used for corn and soybeans. Small grain is less commonly grown. Areas are drained with subsurface drains, surface drains, and open ditches.

These soils are suited to corn and soybeans. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

These soil are suited to grasses and legumes. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

Ponding is a severe limitation for building site development on these soils. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. These soils have severe limitations for local roads and streets because of ponding, low support strength, and frost action potential. Drainage ditches along roads lower the water table and prevent damage caused by frost action. The base for roads should be strengthened with suitable material. Ponding is a severe limitation for septic tank absorption fields on these soils. Commercial sewers and treatment facilities are generally needed.

The soils of this complex are in capability subclass IIw and are not assigned to a woodland suitability subclass.

Sd—Saranac silty clay loam. This nearly level, deep, very poorly drained soil is on flood plains. It is occasionally flooded. Mapped areas are mostly elongated and parallel streams. They range from 5 to 100 acres.

In a typical profile, the surface soil is black silty clay loam about 16 inches thick. The subsoil is about 33 inches thick. The upper part of the subsoil is gray, mottled, very firm silty clay; and the lower part is dark gray and gray, mottled, firm silty clay loam. The underlying material is gray, mottled silty clay loam containing thin strata of silt loam and silty clay. Light colored overwash has accumulated on the surface in some areas. The underlying loam till is within a depth of 60 inches in places.

Included with this soil in mapping, and making up about 5 to 10 percent of the map unit, are Palms and Sloan soils.

Permeability of this Saranac soil is moderately slow. The available water capacity is high. The organic matter content in the surface layer is high. Surface runoff is ponded or very slow. A seasonal high water table is near or above the surface in winter and early in spring. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Chiseling or plowing in the fall is beneficial to tillage operations performed the following spring.

Most areas of this soil are drained by open ditches and subsurface drains and used for corn and soybeans. Inadequately drained or undrained areas are used for pasture or are idle.

This soil is suited to corn and soybeans. Small grain is poorly suited to this soil because of the flooding hazard. Conservation tillage, crop residue management, and cover crops help maintain tilth and organic matter content.

This soil is not suited to grasses and legumes. These crops can be damaged by floodwater and ponding early in spring, even in areas adequately drained for corn and soybeans. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

Woodland management concerns are severe for equipment use, seedling mortality, windthrow hazard, and plant competition. Harvesting should be delayed until dry seasons or until the ground is frozen. Competing vegetation should be controlled by cutting, spraying, or girdling.

This Saranac soil has severe limitations for building site development and is generally not suited to this use because of occasional flooding and ponding. Areas used as building sites should be drained and protected from flooding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding, occasional flooding, and low support strength. Drainage ditches should be constructed along roads to lower the water table. The base for roads should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of ponding and moderately slow permeability. Commercial sewers and treatment facilities are generally needed.

This Saranac soil is in capability subclass IIIw and woodland suitability subclass 2w.

St—Sleeth silt loam. This nearly level, deep, somewhat poorly drained soil is on terraces. Mapped areas are irregular in shape and range from 3 to 70 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 38 inches thick. The upper part of the subsoil is grayish brown, mottled, firm clay loam; the next part is yellowish brown, mottled, firm clay loam; and the lower part of the subsoil is grayish brown, mottled, firm gravelly clay loam. The upper part of the underlying material is grayish brown, mottled loamy coarse sand. The lower part of the underlying material to a depth of 80 inches is yellowish brown sand and gravelly sand. Calcareous loam till is within a depth of 60 inches in many areas.

Included with this soil in mapping are small areas of Westland soils. Also included are small areas of Camden

Variant and Ockley soils on slight rises. These inclusions make up about 10 percent of this map unit.

Permeability of this Sleeth soil is moderate in the subsoil and very rapid in the underlying material. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 3 feet in winter and early in spring. The surface layer is easily tilled throughout a fairly wide range in moisture content.

Nearly all areas of this soil are farmed and used for corn, soybeans, and small grains. A few areas are used for forage. A few undrained areas are in woodland.

This soil is suited to corn, soybeans, and small grain. Wetness is a major limitation for farm use of this soil, but subsurface drains and open ditches are used to drain most areas. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Grazing when wet and overgrazing are the main concerns for pasture management. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for woodlots. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation for building site development on this Sleeth soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of low support strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads needs to be replaced with suitable material. Wetness is a severe limitation for septic tank absorption fields on this soil. Perimeter tile drainage helps to lower the water table.

This Sleeth soil is in capability subclass IIw and woodland suitability subclass 3o.

Su—Sloan silt loam. This nearly level, deep, very poorly drained soil is on nearly level flood plains. This soil is frequently flooded. Mapped areas are mostly elongated, but some are irregular in shape. Areas range from 3 to 40 acres.

In a typical profile, the surface soil is very dark gray silt loam about 13 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is dark gray, mottled, firm loam; and the lower part is gray and grayish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam containing thin strata of sand. In places there is light colored overwash on the surface. In places the loam till is below a depth of 40 inches.

Included with this soil in mapping are Ceresco soils on slightly higher positions. A few areas have a mucky surface layer. These inclusions make up about 5 to 10 percent of this map unit.

Permeability of this Sloan soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow or ponded. A seasonal high water table is near or above the surface in winter and spring. The surface layer can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are drained by subsurface drains and open ditches and are used for corn and soybeans. Some areas are used for hay and pasture. Undrained areas are used for pasture or woodland.

This soil is suited to corn and soybeans. Wetness is the major limitation and flooding is the major hazard for farm use of this soil. Small grain seeded in fall and early in spring can be damaged by ponded water or floodwater or both in winter and early in spring, even if adequate drainage has been established for row crops. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

Quality grasses and legumes do not grow well on this soil unless adequate drainage has been established. Ponding is a hazard in winter and early in spring. The major concern for pasture management is overgrazing or grazing when the soil is wet. Proper stocking rates and timely grazing help to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil. Woodland management concerns are severe for equipment use, seedling mortality, windthrow hazard, and plant competition. Competing vegetation should be controlled by cutting, spraying, or girdling. Harvesting generally has to be delayed until dry seasons or until the ground is frozen.

This soil has severe limitations for building site development, local roads and streets, and septic tank absorption fields, and it is generally not suited to these uses because of ponding and frequent flooding. Low support strength is also a severe limitation for local roads and streets. Alternate sites should be considered.

This Sloan soil is in capability subclass IIIw and woodland suitability subclass 2w.

Sx—Starks silt loam. This nearly level, deep, somewhat poorly drained soil is on till plains. It is also extensive in a small, filled valley just south of Geetingsville. Mapped areas are irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam and sandy clay loam; the next part is grayish brown, mottled, firm fine sandy loam; and the lower part of the subsoil is yellowish brown,

mottled, firm fine sandy loam and friable silt loam. The underlying material to a depth of 67 inches is yellowish brown, mottled silt loam. The solum is less than 40 inches thick in some profiles. Loam till is at a depth of less than 60 inches in some profiles. Some small areas of better drained soils are on slight rises.

Included with this soil in mapping are areas of Fincastle, Reesville, and Whitaker soils. Also included are Cyclone and Mahalasville soils in swales. These inclusions make up about 10 to 15 percent of this map unit.

Permeability of this Starks soil is moderate or moderately slow in the subsoil and moderately rapid in the substratum. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 3 feet in spring. The surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed because adequate drainage has been established. This soil is used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Wetness is a major limitation for farm use, but subsurface drains, surface drains, open ditches, or a combination of these are used to drain the soil. Conservation tillage, crop residue management, and cover crops help to maintain tilth and organic matter content.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for that purpose. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation for building site development on this Starks soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of frost action potential, low support strength, and wetness. Drainage ditches along roads lower the water table and help to prevent damage caused by frost action. The base for roads needs to be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of permeability and wetness. Perimeter tile drainage helps to lower the water table, but commercial sewers and treatment facilities are generally needed.

This Starks soil is in capability subclass IIw and woodland suitability subclass 2o.

Ty—Treaty silt loam. This nearly level, deep, poorly drained soil is in swales and along narrow drainageways on till plains. It is ponded by runoff from adjacent areas. Mapped areas are irregular in shape with fingers extending between better drained, higher-lying soils. Areas range from 3 to 200 acres.

In a typical profile, the upper part of the surface layer is very dark gray silt loam about 9 inches thick, and the lower part is black silt loam about 4 inches thick. The subsoil is about 51 inches thick. The upper part of the subsoil is gray and dark gray, mottled, firm silty clay loam and clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 70 inches is yellowish brown loam. The part of the subsoil developed from silty material is less than 24 inches thick in some profiles. Lighter colored material has washed upon the original dark surface layer in a few areas. In places the upper part of the subsoil contains more clay.

Included with this soil in mapping are Milford and Patton soils in small potholes. Mahalasville and Cyclone soils are also included. Also included are many small, slightly elevated areas of Crosby, Fincastle, and Whitaker soils. A few areas along drainageways have a slope of more than 2 percent. These inclusions make up about 25 percent of the map unit.

Permeability of this Treaty soil is moderate. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow or ponded. A seasonal high water table is near or above the surface in winter and early in spring. This soil has a surface layer that becomes cloddy and hard if it is tilled when wet. Chiseling or plowing in the fall is beneficial to tillage operations performed the following spring.

Most areas of this soil are drained and used for corn, soybeans, and wheat. A few areas are used for hay, pasture, or woodland.

This soil is suited to corn and soybeans. Most areas are drained by subsurface drains, open ditches, surface drains, or a combination of these. Wetness is the main limitation for farm use of this soil. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Drainage is necessary to obtain high yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to reduce surface compaction and maintain good tilth.

This soil is suited to trees. Woodland management concerns are severe for equipment use, plant competition, seedling mortality, and windthrow hazard. Trees that tolerate wetness should be favored in stands. Harvesting is often delayed until dry seasons or until the ground is frozen. Competing vegetation should be controlled by cutting, spraying, or girdling.

This Treaty soil is severely limited for building site development because of ponding. Areas used as

building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil is severely limited for local roads and streets because of low support strength and ponding. Drainage ditches are needed along roads to help lower the water table. The base for roads should be strengthened with suitable material. Ponding is a severe limitation for septic tank absorption fields on this soil. Commercial sewers and treatment facilities are generally needed.

This Treaty soil is in capability subclass IIw and woodland suitability subclass 2w.

Ud—Udorthents, loamy. This nearly level to steep, deep, well drained soil is on upland and terrace areas which have been disturbed and modified. This soil is dominantly near highway interchanges and gravel pits. In places deep cuts have been made in the original land surface, and the soil material was used for fill in lower-lying areas and to provide a smoother, more level landform. In other places the soil material has been removed and used to provide fill for highway grades, overpasses, and exit ramps. Mapped areas range from 3 to 30 acres.

In a typical area of fill, there is a mixture of material from the surface soil, the subsoil, and the substratum. The surface layer is silt loam, loam, or clay loam and generally contains gravel or stones. In a typical area that has been excavated, the material is mainly loam or clay loam glacial till.

Included with this soil in mapping are areas of sand and gravel and small areas of water. Muck is below the fill material in a few areas. In many areas the fill is such material as rock, glass, metal, concrete, and cinders. Also included are poorly drained and somewhat poorly drained areas. Three sanitary landfills are included in this unit. The material in these landfills is variable and includes both soil and nonsoil material.

This soil has moderate to very slow permeability. The available water capacity is moderate. The organic matter content of the surface material is low. This soil is slightly acid to moderately alkaline.

The vegetation on most of this soil is poor quality grasses or low-growing shrubs. Many areas are barren. Dwellings and business establishments have been built on this soil material in a few areas.

Special management practices are needed for this soil. An intensified fertilization program with special emphasis on incorporating organic residue or manure into the soil is needed if areas are to be used for crops. Conservation practices are needed to control erosion on the sloping areas. Drainage may be needed on the nearly level areas. Exposed areas should be replanted as soon as possible after construction. Diversions, box inlet structures, grade stabilization structures, and grassed waterways can be used to control erosion.

An onsite investigation is needed if this soil is to be used for building site development, septic tank absorption fields, or local roads and streets. If this soil is used as a building site, removal of vegetation should be held to a minimum and a protective plant cover should be established as quickly as possible so that erosion losses can be minimized. In places, nearly level areas need drainage. Settling and escaping gases could be a problem at the landfill sites.

Udorthents are in capability class VIII and are not assigned to a woodland suitability subclass.

Wa—Wallkill silt loam. This nearly level, deep, very poorly drained soil is in potholes on till plains and flood plains. It is ponded by runoff from adjacent areas. Most areas in the till plain are oval, but flood plain areas are elongated. Mapped areas range from 2 to 25 acres.

In a typical profile, the surface soil is dark grayish brown silt loam about 17 inches thick. The subsoil is grayish brown, firm silt loam about 5 inches thick. The underlying material to a depth of 52 inches is black muck. Below that to a depth of 60 inches is dark grayish brown silt loam containing thin layers of muck.

Included with this soil in mapping are small areas of Milford, Patton, and Sloan soils. Small undrained areas that stay wet for extended periods are included. Small areas of Houghton and Palms soils are also included. These inclusions make up about 15 percent of this map unit.

Permeability of this Wallkill soil is moderate in the mineral part and moderately rapid in the organic part. The available water capacity is very high. The organic matter content is moderate. Surface runoff is ponded. A seasonal high water table is near or above the surface in winter and spring. The surface layer is friable and can be tilled throughout a wide range in moisture content.

Most areas of this soil are used for corn and soybeans, although the crops are often damaged by ponded water because of inadequate drainage. The areas that are farmed are drained by subsurface drains and, in some cases, open ditches. Surface inlet risers are generally needed in combination with the tile system. Subsidence of the organic material is often a problem after drainage has been established. Several areas are idle or are used for pasture because of wetness (fig. 12).

This soil is suited to corn and soybeans. Ponding is the main limitation for farm use of this soil. Small grain seeded in fall and early in spring can be damaged by ponding even when satisfactory drainage has been established for row crops. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is poorly suited to grasses and legumes for hay or pasture. Drainage is needed for good yields. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, timely grazing, restricted use during wet periods, and pasture rotation help to keep the soil and pasture in good condition.

This soil is not suited to trees except for a few water-

Figure 12.—A recently installed tile drainage system in Wallkill silt loam. A deep cut through the Miami soil in the background was necessary to drain this Wallkill soil.

tolerant trees. Woodland management concerns are severe for equipment use, seedling mortality, windthrow hazard, and plant competition. Harvesting can be delayed until dry seasons or until the ground is frozen. Competing vegetation should be controlled by cutting, spraying, or girdling.

This soil has severe limitations for building site development, local roads and streets, and septic tank absorption fields, and it is generally not suited to these uses because of ponding or low support strength. Alternate sites should be considered for these uses.

This Wallkill soil is in capability subclass IIIw and woodland suitability subclass 4w.

We—Westland silty clay loam. This nearly level, deep, very poorly drained soil is on terraces and along upland drainageways. It is ponded by runoff from adjacent areas. Mapped areas are mostly elongated and parallel streams. They range from 3 to 60 acres.

In a typical profile, the upper 9 inches of the surface soil is very dark gray silty clay loam, and the lower 7 inches is black clay loam. The subsoil is about 38 inches thick. The upper part of the subsoil is dark gray, mottled, firm clay loam; the next part is gray, mottled, firm clay loam; and the lower part of the subsoil is dark gray, mottled, firm gravelly clay loam. The underlying material to a depth of 60 inches is gray sand and gravelly sand. The combined surface layer and subsoil developed from silty material is as much as 40 inches thick in places. In places the original black surface soil is covered with lighter colored soil that washed from surrounding slopes.

Included with this soil in mapping are a few small, slightly elevated areas of Sleeth soils. Also included are Patton, Milford, and Mahalasville soils. The inclusions make up 15 to 20 percent of this map unit.

Permeability of this Westland soil is slow in the subsoil and very rapid in the underlying material. The available water capacity is high. The organic matter content of the surface layer is high. Surface runoff is very slow to ponded. A seasonal high water table is near or above the surface in winter and spring. The surface layer can be tilled only through a narrow range in moisture content without becoming cloddy and hard. Fall plowing is beneficial to tillage operations.

Most areas of this soil are farmed because adequate drainage has been established. This soil is used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodlots. A few small abandoned gravel pits are located in areas of this soil.

This soil is suited to corn and soybeans. Wetness is a major limitation, but subsurface drains, open ditches, surface drains, or a combination of these are used to drain this soil. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Grasses and legumes may be damaged by ponded water. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates and timely grazing helps to keep the pasture and soil in good condition.

Water-tolerant trees grow well on this soil. Woodland management concerns are severe for equipment use, seedling mortality, windthrow hazard, and plant competition. Competing vegetation should be controlled by cutting, spraying, or girdling. Harvesting can be delayed until dry seasons or until the ground is frozen.

Ponding is a severe limitation for building site development of this Westland soil. Areas used as building sites should be drained and protected from ponding. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of ponding and low support strength. Drainage ditches are needed along roads to lower the water table. The base for roads should be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of slow permeability and ponding. Commercial sewers and treatment facilities are generally needed.

This Westland soil is in capability subclass IIw and woodland suitability subclass 2w.

Wh—Whitaker silt loam. This nearly level, deep, somewhat poorly drained soil is on till plains and low-lying stream terraces. Mapped areas are irregular in shape and range from 3 to 25 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 2 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is light brownish gray and yellowish brown, mottled, firm silt loam and silty clay loam; the next part is grayish brown and yellowish brown, mottled, firm clay loam; and the lower part of the subsoil is yellowish brown, mottled, firm sandy loam. The underlying material to a depth of 70 inches is yellowish brown and light yellowish brown, mottled, stratified silt loam, fine sand, and loamy sand. In places the thickness of the combined surface layer and subsoil is less than 30 inches. Loam till is within a depth of 60 inches in places.

Included with this soil in mapping are small areas of Mahalasville soils in depressions and a few small, elevated areas of Martinsville soils. Also included are Starks and Fincastle soils. These inclusions make up about 20 percent of the map unit.

Permeability of this Whitaker soil is moderate in the subsoil and moderate to moderately rapid in the underlying material. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is often at a depth of 1 foot to 3 feet in winter and early in spring. The surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed because adequate drainage has been established. This soil is used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grain. Wetness is a major limitation to farm use, but subsurface drains, surface drains, open ditches, or a combination of these can be used to drain this soil. Crop residue retained on the soil surface throughout the year protects the soil from erosion and helps to develop and maintain good soil structure and tilth.

This soil is suited to grasses and legumes. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, timely grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, but is is seldom used for woodlots. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation for building site development on this soil. Areas used as building sites should be drained. Dwellings and small buildings should be constructed without basements. This soil has severe limitations for local roads and streets because of frost action potential and low support strength. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads needs to be strengthened with suitable material. Wetness is a severe limitation for septic tank absorption fields on this soil. Perimeter tile drainage helps to lower the water table.

This Whitaker soil is in capability subclass IIw and woodland suitability subclass 3o.

XeA—Xenia silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on slight rises on broad till plains. Mapped areas are irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The subsoil is yellowish brown and is about 35 inches thick. The upper part of the subsoil is firm silty clay loam; the next part is mottled, firm silty clay loam; and the lower part is mottled, firm clay loam. The underlying material to a depth of 60 inches is brown loam. There are small areas that have a slope of more than 2 percent. The depth to firm loam till is more than 60 inches in places. In places the silty material is less than 24 inches thick.

Included with this soil in mapping are small areas of Crosby, Fincastle, Miami, and Russell soils. Also included are areas of Cyclone and Ragsdale soils in drainageways. These inclusions make up about 15 percent of this map unit.

Permeability of this Xenia soil is moderately slow. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is slow. A seasonal high water table is often at a depth of 2 to 6 feet in spring. The friable surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, or truck crops. A few areas remain wooded.

This soil is suited to corn, soybeans, small grain, and truck crops. Conservation tillage, crop residue management, and cover crops help to maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but it is seldom used for woodland. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness and shrink-swell potential are moderate limitations for building site development on this Xenia soil. Areas used as building sites should be drained. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of this soil. Foundation drainage helps to remove excess water. This soil has severe limitations for local roads and streets because of low support strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base for roads needs to be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of wetness and permeability. Perimeter tile drainage and a large absorption field helps this soil to function better for this use.

This Xenia soil is is capability class I and woodland suitability subclass 1o.

XeB—Xenia silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on slight rises and side slopes paralleling drainageways on broad till plains. Mapped areas are broad and irregular in shape and range from 3 to 40 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is dark yellowish brown, mottled, firm silt loam; the next part is dark yellowish brown, mottled, firm silty clay loam; and the lower part of the subsoil is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is brown loam. Some profiles have a thin layer of loamy outwash in the lower part of the subsoil. The depth to loam till is more than 60 inches in places. The silty material is less than 24 inches thick in places.

Included with this soil in mapping are small areas of Crosby and Fincastle soils. Also included are areas of Miami and Russell soils on slightly higher-lying areas and Cyclone and Ragsdale soils in depressions. A few areas are severely eroded. These inclusions make up 25 to 30 percent of this map unit.

Permeability of this Xenia soil is moderately slow. The available water capacity is high. The organic matter content of the surface layer is moderate. Surface runoff is medium. A seasonal high water table is at a depth of 2 to 6 feet in spring. The friable surface layer is easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are farmed and used for corn, soybeans, and small grain. A few areas are used for hay, pasture, truck crops, or woodland.

This soil is suited to corn, soybeans, small grain, and truck crops. Crop rotation, conservation tillage, diversions, contour farming, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. The use of crop residue and cover crops help to maintain tilth and organic matter content.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet results in soil compaction and poor tilth. Proper stocking rates, pasture rotation, and timely grazing help to keep the pasture and soil in good condition.

This soil is suited to trees, but only a few areas are wooded. Most woodland management concerns are slight. Plant competition is moderate, and competing vegetation should be controlled by cutting, spraying, or girdling.

Wetness and shrink-swell potential are moderate limitations for building site development on this Xenia soil. Areas used as building sites should be drained. Drains around foundations help to remove excess water. Foundations and basement walls should be properly designed to prevent structural damage caused by shrinking and swelling of the soil. This soil has severe limitations for local roads and streets because of low support strength and frost action potential. Drainage ditches along roads help to prevent damage caused by frost action. The base material for roads needs to be strengthened with suitable material. This soil has severe limitations for septic tank absorption fields because of wetness and permeability. Perimeter tile drainage and a large absorption field help this soil to function better for this use.

This Xenia soil is in capability subclass IIe and woodland suitability subclass 1o.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Elvis O. Douglas, district conservationist, Soil Conservation Service, assisted in preparing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 231,700 acres in the survey area was used for crops and pasture in 1967 (*3*). Of this, 11,000 acres was used for permanent pasture; 174,000 acres for row crops, mainly corn; 18,500 acres for close-grown crops, mainly wheat and oats; and 9,700 acres for rotation hay and pasture. The rest was idle or used for conservation purposes.

Most of the farmland in Clinton County is utilized to its fullest potential. About 10,000 acres of potentially good cropland is being used as woodland and about 8,300 acres as pasture (*3*). This land represents a reserve productive capacity. Food production could also be increased by extending the latest crop production technology to all cropland in the county. Information in this soil survey can facilitate the application of such technology.

Soil wetness is the major soil problem on about 80 percent of the cropland and pastureland in Clinton County. Most of the poorly drained and very poorly drained soils, such as the Drummer, Ragsdale, Mahalasville, Milford, Westland, Patton Saranac, Sable, Sloan, and Treaty soils, are artificially drained for farm production. There are about 52,620 acres of such soils. A few areas of these soils are in low-lying depressions and can not be economically drained. This is especially true of Patton and Milford soils.

The very poorly drained organic soils, such as the Houghton, Palms, and Wallkill soils, are very difficult to drain. Most of such areas are not satisfactorily drained. There are about 750 acres of these organic soils in the county.

If not artificially drained, the somewhat poorly drained soils are so wet that crops are damaged in most years. The somewhat poorly drained Brenton, Ceresco, Fincastle, Raub, Reesville, Sleeth, Starks, and Whitaker soils make up about 102,050 acres.

The Dana, Miami, Parr, Proctor, Russell, and Xenia soils have adequate natural drainage for most of the year, but they often dry slowly after a rain. Small areas of wet soils along drainageways and in swales are

commonly included with these soils in mapping, especially in those areas that have slopes of 2 to 6 percent. Artificial drainage is needed in some of these wet areas.

The Camden Variant, Martinsville, Fox, Genesee, and Landes soils have good natural drainage and dry fairly quickly after a rain.

The design of surface and subsurface drainage systems varies according to the kind of soil. A combination of surface and subsurface drainage is needed in most areas of the poorly drained and very poorly drained soils used for intensive row crops. Subsurface drainage is needed in the somewhat poorly drained soils. Drains have to be more closely spaced in soils that have slow permeability than in the soils that are more permeable. Subsurface drainage is slow in Patton and Milford soils.

Organic soils oxidize and subside when the pore spaces fill with air; therefore, special drainage systems are needed to control the depth and the period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during the rest of the year minimizes oxidation and subsidence of organic soils.

Information on drainage design for each kind of soil is available in local offices of the Soil Conservation Service.

Soil erosion is the major soil problem on about 13 percent of the cropland and pastureland in Clinton County. If slope is more than 2 percent, erosion is a hazard. The Miami-Crosby map unit has both erosion and wetness hazards. The Crosby soil usually needs tile drainage.

Loss of the surface layer through erosion is damaging for two reasons. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Soil erosion also results in sediment entering the streams. Controlling erosion and sedimentation minimizes pollution of streams by sediment and improves the quality and quantity of water for municipal use, for recreation, and for fish and wildlife habitat.

In many sloping fields, preparation of a good seedbed is difficult on clayey spots because the original friable surface soil has been eroded away. Such spots are in areas of Miami and Fox soils. Glacial till exposed in some of the most severely eroded areas is difficult to cultivate.

Erosion control practices and cropping systems that keep a vegetative cover on the soil help to reduce runoff and erosion and increase infiltration. On livestock farms which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve soil tilth.

Slopes are so short and irregular that contour farming is not practical on such sloping soils as the Miami and Russell soils. However, diversions and parallel tile outlet terraces can reduce erosion. These are most practical on deep, well drained soils that are susceptible to erosion. Terracing reduces soil loss and the associated loss of fertilizer elements; reduces the need for a grassed waterway; and makes it easier to farm sloping soils. Some of the Miami, Xenia, and Russell soils are suitable for parallel tile outlet terraces. Such soils as the Fox soils which have sand and gravel at a depth of less than 40 inches are less suitable for terraces and diversions.

Waterways are needed on many areas of sloping soils, such as Miami and Russell soils. In addition, waterways are often needed on the more sloping areas of the poorly drained and somewhat poorly drained soils where a large watershed drains across these soils. Subsurface drainage is generally needed where waterways are installed in the somewhat poorly drained, poorly drained, and very poorly drained soils. Many areas of the Miami soils are seepy along drainageways, and subsurface tile should be installed in the waterways.

Because of the large number of open ditches in the county, many grade stabilization structures are needed. These structures help to reduce erosion where surface water drains into an open ditch. Structures are often needed in open ditches where the grade is too steep, and the water moves so rapidly that it erodes the sides and bottom of some channels.

Wind erosion is a hazard on the mucky Houghton and Palms soils if they are drained. Such erosion can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining a vegetative cover, surface mulch, or rough surface layer through proper tillage minimizes wind erosion on these soils. Windbreaks of such adapted shrubs as Tatarian honeysuckle or autumn-olive are effective in reducing wind erosion on the muck soils.

Wind erosion also occurs on the dark mineral soils if they have no vegetative cover and are dry. Soils that are plowed in the fall are susceptible to wind erosion the following spring if the surface layer is dry and barren.

Soil fertility is high or moderate for most upland and terrace soils in the survey area. Such poorly drained and very poorly drained soils as the Cyclone, Saranac, Drummer, Houghton, Mahalasville, Milford, Palms, Patton, Sable, Ragsdale, Treaty, Sloan, Wallkill, and Westland soils are neutral or slightly acid. These soils are in slight depressions and receive runnoff from adjacent upland soils. Soils on flood plains, such as the Ceresco, Genesee, and Landes soils, are neutral or mildly alkaline and are higher in plant nutrients than most upland and terrace soils. Also, the soils that developed under prairie vegetation in the south-central and southwestern parts of the county are generally more fertile than those in the rest of the county.

Most soils on uplands and terraces are strongly acid or medium acid except the black, very poorly drained and poorly drained soils in depressions. These soils usually require applications of ground limestone to raise the pH level for good growth of alfalfa and other

legumes. On all soils, the addition of lime and fertilizer should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. Soil tilth is best in the dark soils because of the higher organic matter content.

Many of the soils used for crops in the survey area have a silt loam surface layer that is light in color and moderate in organic matter content. Generally the structure of these soils is weak, and intense rainfall causes the formation of a surface crust. When dry, this crust is hard and reduces infiltration and increases runoff. Regular addition of crop residue, manure, and other organic material helps to improve soil structure and reduce crust formation. The dark prairie soils that have a silt loam surface layer do not crust as much as similar textured, light colored soils.

The dark Cyclone, Sable, Saranac, Treaty, Ragsdale, Drummer, Mahalasville, Milford, Patton, and Westland soils have a high percentage of clay in the surface layer. Tilth is a problem because the soils often stay wet until late in spring. If plowed when wet, these soils become very cloddy as they dry, and good seedbeds are difficult to prepare. Chiseling or plowing in the fall generally results in good tilth the following spring if freezing and thawing occurs during the winter.

Soil structure is adversely affected by plowing if the soil is wet. Plowing when the soil is wet should be avoided as much as possible. A chisel plow can be used as an alternative to the moldboard plow in the fall. Chiseling helps reduce soil erosion and blowing in winter and early in spring.

Corn and, to an increasing extent, soybeans are the main row crops in the county. Wheat and oats are the close-growing crops.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to vegetables and small fruits. In Clinton County these are the Ockley, Fox, Martinsville, and Camden Variant soils that have slopes of less than 6 percent, and they total about 8,380 acres. Fox soils need irrigation for optimum production. Crops can generally be planted and harvested earlier on these soils than on the other soils in the county. Tomatoes and cucumbers are grown in the northern part of the county, usually on such light colored soils as the Miami, Fincastle, and Camden Variant soils.

If adequately drained, the muck soils in the county are well suited to a wide range of vegetables. Houghton and Palms muck soils make up about 440 acres in the survey area.

Most of the well drained soils in the survey area are suitable for orchards and nursery plants. However, soils in low-lying areas where frost is frequent and air drainage is poor generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The

numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and

codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bluegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, beggarweed, bristlegrass, panicgrass, polkweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, spikerush, wild millet, wildrice, saltgrass, algae, duckweed, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tail deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife

attracted to such areas are ducks, geese, shore birds, rails, kingfishers, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

In 1967 there was about 10,000 acres of urban and developed land in the county. These areas have grown at the rate of about 40 acres per year (*3*).

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding and ponding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, ponding, and flooding affect the ease of excavation and construction. Landscaping and grading

that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and

cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The table gives restrictive features that affect pond reservoir areas; embankments, dikes, and levees; aquifer-fed ponds; drainage; terraces and diversions; and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent.

Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

soil and water features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density,

permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Brenton series

The Brenton series consists of deep, somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in silty material and in the underlying lacustrine sediment. Slope ranges from 0 to 2 percent.

Brenton soils are similar to Raub and Starks soils and are commonly near Mahalasville and Proctor soils. Raub soils lack stratification in the lower part of the solum. Starks soils have an ochric surface layer. Mahalasville soils have a grayer subsoil and are in depressions. Proctor soils do not have mottles in the upper 6 inches of the subsoil.

Typical pedon of Brenton silt loam, in a cultivated field, 2,300 feet west and 400 feet north of the southeast corner of sec. 31, T. 21 N., R. 1 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; slightly acid; abrupt smooth boundary.

B21t—11 to 23 inches; brown (10YR 5/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and many medium faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine and medium pores; thin continuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) organic coatings and clay films on faces of peds and in root channels; neutral; clear smooth boundary.

B22t—23 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; many fine and medium pores; thin patchy dark grayish brown (10YR 4/2) organic coatings and clay coatings in root channels and pores; neutral; abrupt smooth boundary.

IIB23t—32 to 40 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common medium and fine pores; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; 2 percent fine gravel; neutral; abrupt smooth boundary.

IIB24t—40 to 44 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few fine pores; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIIB3—44 to 54 inches; yellowish brown (10YR 5/6) loamy sand; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; 3 percent fine gravel; neutral; clear smooth boundary.

IIIC—54 to 60 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) loamy sand; massive; loose; 10 percent fine gravel; slight effervescence; mildly alkaline.

The solum is 36 to 60 inches thick. Thickness of silty material ranges from 25 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles with chroma of less than 2 are within 6 inches of the base of the mollic epipedon. The B2t horizon ranges from medium acid to neutral. The IIBt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is clay loam, silt loam, loam, or sandy loam. The IIBt horizon is medium acid to neutral. The IIIB3 horizon, if present, ranges from neutral to mildly alkaline and contains carbonates in some pedons. The C horizon is stratified silt loam, loam, sandy loam, or loamy sand. It ranges from neutral to moderately alkaline and contains carbonates in most profiles.

Camden Variant

The Camden Variant consists of deep, well drained, moderately permeable soils on till plains. These soils formed in loess, stratified glacial drift, and the underlying loam till. Slope ranges from 0 to 2 percent.

Camden Variant soils are similar to Ockley and Russell soils and are commonly near Fincastle, Miami, and Starks soils. Ockley soils have more gravel in the solum and a substratum of loose, gravelly coarse sand. Russell soils do not have stratified loamy material in the lower part of the subsoil. Fincastle soils have a gray, mottled subsoil. Miami soils have more sand in the upper part of the subsoil and a substratum of loam till. Starks soils have a gray, mottled subsoil and a substratum of stratified sand and silt.

Typical pedon of Camden Variant silt loam, 0 to 2 percent slopes, in a cultivated field, 1,850 feet west and 1,000 feet north of the southeast corner of sec. 23, T. 23 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

A12—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure; friable; medium acid; clear smooth boundary.

B1t—12 to 17 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin continuous brown (10YR 5/3) clay films on faces of peds; medium acid; clear wavy boundary.

B21t—17 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin continuous brown (10YR 5/3) clay films on faces of peds; medium acid; clear wavy boundary.

IIB22t—26 to 32 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin continuous medium brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

IIB23t—32 to 48 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; common fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 4 percent gravel; slightly acid; gradual wavy boundary.

IIB31t—48 to 59 inches; dark yellowish brown (10YR 4/4) stratified sandy loam and loamy sand; weak medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) and very dark gray (10YR 3/1) clay films on faces of peds; 5 percent gravel; slightly acid; abrupt wavy boundary.

IIIB32t—59 to 65 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear irregular boundary.

IIIC—65 to 80 inches; yellowish brown (10YR 5/4) loam; massive; friable; strong effervescence; moderately alkaline.

The solum is 50 to 80 inches thick. Loess thickness ranges from 24 to 36 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The A horizon ranges from medium acid to neutral. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 or 6. It is slightly acid to strongly acid. The IIBt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay loam, clay loam, loam, or sandy loam. The IIBt horizon contains up to 10 percent gravel. The IIB3 horizon developed in outwash material is sandy loam or loamy sand. The IIBt and IIB3 horizons range from medium acid to neutral. The IIIB3 horizon developed from till is loam or clay loam. The IIIB3 horizon is neutral or mildly alkaline and contains carbonates in some profiles.

Ceresco series

The Ceresco series consists of deep, somewhat poorly drained soils on flood plains. Permeability is moderate or moderately rapid. These soils formed in loamy alluvium. Slope ranges from 0 to 2 percent.

Ceresco soils are commonly adjacent to Genesee and Sloan soils. Genesee soils have a brown, mottle-free subsoil. Sloan soils have a grayer subsoil.

Typical pedon of Ceresco loam, in a wooded area, 920 feet west and 920 feet north of the southeast corner of sec. 14, T. 22 N., R. 1 W.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many roots; neutral; clear wavy boundary.

B1—10 to 14 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few fine roots; many fine and medium pores; neutral; clear wavy boundary.

B2—14 to 33 inches; grayish brown (10YR 5/2) loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few roots; common fine and medium pores; neutral; clear wavy boundary.

C1—33 to 42 inches; grayish brown (10YR 5/2) sandy loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine pores; neutral; gradual wavy boundary.

C2—42 to 60 inches; grayish brown (10YR 5/2) sand and loamy sand; many medium and coarse distinct yellowish brown (10YR 5/6) and very dark grayish brown (10YR 3/2) mottles; massive; friable; neutral; clear wavy boundary.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. It is loam or sandy loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam, sandy loam, or silt loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy loam, loamy sand, or sand. The A, B, and C horizons are neutral or mildly alkaline and contain carbonates below a depth of 40 inches in some profiles.

Crosby series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on till plains. These soils formed in loess and the underlying glacial till. Slope ranges from 0 to 6 percent. These soils have less clay in the subsoil than is defined for the Crosby series, but this difference does not alter their usefulness and behavior.

Crosby soils are commonly near Cyclone, Fincastle, Miami, and Treaty soils. Cyclone and Treaty soils have a mollic surface layer and are in depressions and along drainageways. Fincastle soils have less sand in the upper 20 inches of the argillic horizon and have a thicker solum. Miami soils have a brown, mottle-free subsoil and are on higher positions in the landscape.

Typical pedon of a Crosby silt loam, in an area of Fincastle-Crosby silt loams, 0 to 3 percent slopes, in a cultivated field, 1,500 feet west and 2,500 feet south of the northeast corner of sec. 2, T. 23 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1t—8 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many fine roots; many fine pores; thin continuous light brownish gray (10YR 6/2) silt coatings and clay films on faces of peds; medium acid; clear smooth boundary.

B21t—13 to 17 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

IIB22t—17 to 31 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; many fine pores; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; 5 percent gravel; slightly acid; clear wavy boundary.

IIB23t—31 to 40 inches; yellowish brown (10YR 5/4) loam; few medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; many fine pores; thin patchy brown (7.5YR 4/2) clay films on faces of peds; 5 percent gravel; neutral; gradual wavy boundary.

IIC—40 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. Loess thickness ranges from 8 to 18 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt and IIBt horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 6. The B2t horizon is silty clay loam or silty clay. The IIBt horizon is clay loam or loam. The Bt and IIBt horizons range from neutral to strongly acid. The IIB3 horizon, where present, is neutral or mildly alkaline and contains carbonates in some profiles.

Cyclone Series

The Cyclone series consists of deep, poorly drained, moderately permeable soils on till plains. These soils formed in silty material and the underlying till. Slope ranges from 0 to 2 percent.

Cyclone soils are similar to Ragsdale and Treaty soils and are commonly near Fincastle and Starks soils. Ragsdale soils formed in loess and contain less sand in the lower part of the solum and the C horizon. Treaty soils are shallower to the IIB horizon. Fincastle and Starks soils have an ochric surface layer and are on higher-lying areas.

Typcial pedon of Cyclone silt loam, in a cultivated field, 1,750 feet east and 1,800 feet south of the northwest corner of sec. 27, T. 21 N., R. 2 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A12—9 to 14 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; common fine distinct olive brown (2.5Y 4/4) mottles; moderate fine and medium subangular blocky structure; firm; neutral; clear wavy boundary.

B21tg—14 to 20 inches; dark gray (10YR 4/1) silty clay loam; common fine and medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual wavy boundary.

B22tg—20 to 38 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; common fine pores; few thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual wavy boundary.

B23t—38 to 49 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin patchy dark gray (10YR 4/1) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions; neutral; gradual wavy boundary.

IIB3t—49 to 60 inches; yellowish brown (10YR 5/4) loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy gray (10YR 5/1) clay films on faces of peds; 5 percent gravel; neutral; clear wavy boundary.

IIC—60 to 70 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 55 to 75 inches thick. Thickness of the silty material ranges from 40 to 60 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The B21t and B22t horizons have hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. The B23t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. The IIBt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or clay loam.

Dana series

The Dana series consists of deep, moderately well drained soils on till plains. Permeability is moderate in the solum and moderately slow in the underlying material. These soils formed in loess and the underlying till. Slope ranges from 0 to 6 percent.

Dana soils are similar to Raub soils and are commonly near Drummer and Parr soils. Raub soils have gray mottles in the upper 6 inches of the subsoil. Drummer soils have a gray subsoil and are in depressions. Parr soils have a brown, mottle-free subsoil, a fine loamy control section, and are on higher positions in the landscape.

Typical pedon of Dana silt loam, 0 to 2 percent slopes, in a cultivated field, 2,250 feet west and 2,600 feet north of the southeast corner of sec. 18, T. 21 N., R. 1 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B21t—10 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—18 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of prisms; few very dark grayish brown (10YR 3/2) iron and manganese oxide concretions; medium acid; clear wavy boundary.

IIB23t—29 to 40 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 5 percent gravel; neutral; clear wavy boundary.

IIC—40 to 60 inches; brown (10YR 5/3) loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; massive; firm; few thin very dark gray (10YR 3/1) clay films on old fracture faces; 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 36 to 66 inches thick. Loess thickness ranges from 24 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bt and IIBt horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles with chroma of less than 2 are in the lower part of the argillic horizon. The IIBt horizon is loam or clay loam. The Bt horizon is dominantly medium acid or strongly acid and the IIBt horizon is medium acid to neutral.

Drummer series

The Drummer series consists of deep, poorly drained, moderately permeable soils on till plains. These soils formed in loess and the underlying loam till. Slope ranges from 0 to 2 percent.

Drummer soils are similar to Mahalasville and Ragsdale soils and are commonly adjacent to Dana and Raub soils. Mahalasville soils have an argillic horizon and a stratified substratum. Ragsdale soils have an argillic horizon, formed in loess, and contain less sand in the lower part of the solum and the C horizon. Dana and Raub soils are on slight rises and have a browner subsoil.

Typical pedon of Drummer silty clay loam, in a cultivated field, 1,470 feet west and 1,650 feet south of the northeast corner of sec. 32, T. 21 N., R. 1 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; firm; medium acid; abrupt smooth boundary.

A12—10 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; firm; many fine roots; common fine and very fine pores; slightly acid; abrupt smooth boundary.

B1—14 to 17 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; common medium distinct olive brown (2.5Y 4/4) mottles; moderate fine and medium subangular blocky structure; firm; many fine roots; common fine and very fine pores; neutral; clear smooth boundary.

B21g—17 to 25 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct light olive brown (2.5Y 5/4) mottles; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; many fine roots along prism faces; common fine and very fine pores; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; many black (10YR 2/1) iron and manganese oxide concretions; black (10YR 2/1) silty clay loam linings in krotovinas; neutral; clear smooth boundary.

B22g—25 to 39 inches; gray (10YR 5/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; few fine roots along prism faces; common fine pores; thin continuous very dark gray (10YR 3/1) coatings on prism faces; many black (10YR 2/1) iron and manganese oxide concretions; black (10YR 2/1) silty clay loam linings in krotovinas; neutral; gradual smooth boundary.

B23—39 to 52 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct gray (10YR 5/1) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; few fine pores; dark grayish brown (10YR 4/2) silty clay linings in some pores; black (10YR 2/1) silty clay loam linings in krotovinas; neutral; clear smooth boundary.

IIB3—52 to 62 inches; yellowish brown (10YR 5/6) loam; many medium and coarse distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few fine roots; few fine pores; dark grayish brown (10YR 4/2) silty clay loam linings in some pores; 3-inch layer of gray (10YR 5/1) loamy sand immediately above the loam till; 5 percent fine gravel; neutral; gradual smooth boundary.

IIC—62 to 70 inches; gray (10YR 5/1) loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 44 to 80 inches thick. Loess thickness ranges from 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B21 and B22 horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The B23 and IIB3 horizons have hue of 10YR, value of 5, and chroma of 4 or 6. The B23 horizon is silty clay loam or silt loam. The IIB3 horizon is loam, clay loam, or sandy loam and is neutral or mildly alkaline.

Fincastle series

The Fincastle series consists of deep, somewhat poorly drained soils on till plains. Permeability is moderately slow in the subsoil and slow in the underlying material. These soils formed in loess and the underlying glacial till. Slope ranges from 0 to 3 percent.

Fincastle soils are similar to Crosby, Starks, and Xenia soils and are commonly near Cyclone, Ragsdale, and Treaty soils. Crosby soils have a thinner solum. Starks soils have a stratified substratum. Xenia soils are not mottled immediately below the surface layer. Cyclone, Ragsdale, and Treaty soils have a mollic surface layer and are in depressions.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, in a cultivated field, 1,100 feet east and 1,100 feet north of the southwest corner of sec. 22, T. 22 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 13 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; many medium distinct black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

B21t—13 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; many fine roots; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; many thin continuous light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.

B22t—17 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; few fine pores; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds and linings of pores; few soft black (10YR 2/1) iron and manganese oxide accumulations; few small pebbles and coarse sand grains in lower part; medium acid; clear wavy boundary.

IIB23t—32 to 46 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; medium discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; 5 percent gravel; slightly acid; clear smooth boundary.

IIB3t—46 to 59 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; few thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds and linings of pores; slightly acid; abrupt smooth boundary.

IIC—59 to 70 inches; yellowish brown (10YR 5/4) loam; many medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; strong effervescence; moderately alkaline.

This solum is 40 to 70 inches thick. Loess thickness ranges from 24 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The IIB2 horizon has similar colors and is clay loam or loam. The B2t and IIB2t horizons range from strongly acid to slightly acid. Some pedons contain a layer of sandy loam or loamy sand as much as 12 inches thick in the IIB3 horizon. The IIB3 horizon ranges from slightly acid to mildly alkaline and contains carbonates in some profiles.

Fox series

The Fox series consists of well drained soils that are moderately deep over sand and gravel. Permeability is moderate in the subsoil and rapid in the underlying material. These soils are on terraces and small upland knolls. They formed in silty and loamy outwash. Slope ranges from 2 to 15 percent.

Fox soils are similar to Ockley and Martinsville soils and are commonly adjacent to Ockley, Martinsville, Miami, and Sleeth soils. Ockley soils have a thicker solum. Martinsville soils have less gravel in the solum and have underlying material of stratified loamy and sandy sediment. Miami soils have a loam till substratum and are on higher areas. Sleeth soils have a grayer, mottled subsoil and are on lower flats.

Typical pedon of Fox silt loam, 2 to 6 percent slopes, in a cultivated field, 1,300 feet east and 700 feet south of the northwest corner of sec. 27, T. 22 N., R. 2 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; medium acid; abrupt smooth boundary.

B1—8 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; medium acid; clear wavy boundary.

B21t—11 to 16 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; many roots; few thin pale brown (10YR 6/3) silt

coatings on face of peds; thin patchy dark reddish brown (5YR 4/3) clay films on faces of peds; 3 percent gravel; medium acid; gradual wavy boundary.

B22t—16 to 25 inches; dark brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; few roots; thin continuous reddish brown (5YR 5/4) clay films on faces of peds; 15 percent gravel; medium acid; gradual wavy boundary.

B23t—25 to 31 inches; dark (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; 10 percent gravel; slightly acid; gradual wavy boundary.

B24t—31 to 35 inches; dark reddish brown (5YR 3/4) gravelly sandy clay loam; weak medium subangular blocky structure; thin dark reddish brown (5YR 3/3) clay films on faces of peds; 18 percent gravel; neutral; gradual wavy boundary.

IIC1—35 to 38 inches; dark brown (10YR 4/3) gravelly loamy sand; single grain; loose; 30 percent gravel; slight effervescence; mildly alkaline; abrupt irregular boundary.

IIC2—38 to 60 inches; yellowish brown (10YR 5/4) sand and gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is silt loam, loam, sandy loam, or gravelly loam. The B2t horizon has hue of 5YR, 7.5YR, or 10YR; value of 3 or 4; and chroma of 3 or 4. It is clay loam, sandy clay loam, gravelly clay loam, gravelly sandy clay loam, or silty clay loam. The most acid part of the B2t horizon is slightly acid or medium acid.

Genesee series

The Genesee series consists of deep, well drained soils on flood plains. Permeability is moderate to a depth of about 40 inches and rapid below that depth. The soils formed in loamy alluvium. Slope ranges from 0 to 2 percent.

Genesee soils are adjacent to Fox, Landes, and Ceresco soils. Fox soils have more gravel in the subsoil and are on slightly higher parts in the landscape. Ceresco soils have a grayish, mottled subsoil and are usually in lower areas. Landes soils have more sand in the profile above a depth of 40 inches.

Typical pedon of Genesee silt loam, sandy substratum, in a cultivated field, 200 feet west and 1,050 feet south of the northwest corner of sec. 27, T. 22 N., R. 2 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, dark grayish brown (10YR 4/2) crushed, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; many thin patchy dark brown (10YR 3/3) organic coatings on faces of peds; neutral; clear smooth boundary.

B2—9 to 18 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common fine roots; many fine and medium pores; thin patchy dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; gradual wavy boundary.

C1—18 to 29 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; many fine and medium pores; neutral; gradual wavy boundary.

C2—29 to 40 inches; dark yellowish brown (10YR 4/4) loam; massive; friable; few fine pores; slight effervescence; mildly alkaline; gradual wavy boundary.

C3—40 to 49 inches; dark yellowish brown (10YR 4/4) sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline; gradual wavy boundary.

C4—49 to 60 inches; yellowish brown (10YR 5/4) sand; many medium distinct grayish brown (10YR 5/2) mottles; single grain; loose; strong effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or loam and is neutral or mildly alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam containing thin layers of sandy loam. Sand, loamy fine sand, and fine sand are below a depth of 40 inches. Depth to carbonates ranges from 20 to 40 inches.

Hennepin series

The Hennepin series consists of deep, well drained, moderately slowly permeable soils on breaks of till plains. These soils formed in glacial till. Slope ranges from 18 to 50 percent.

Hennepin soils are commonly near Miami and Fox soils. Miami soils have a thicker solum and are on less sloping ridgetops. Fox soils have more gravel in the solum, underlying material of loose sand and gravel, and are on lower areas.

Typical pedon of Hennepin silt loam, 18 to 50 percent slopes, in a wooded area, 2,540 feet south and 20 feet west of the northeast corner of sec. 29, T. 22 N., R. 2 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; few pebbles; slight effervescence; mildly alkaline; clear smooth boundary.

B2—4 to 11 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; firm; 5 percent gravel; slight effervescence; mildly alkaline; clear smooth boundary.

C—11 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; 10 percent gravel; strong effervescence; moderately alkaline.

The solum is 11 to 20 inches thick.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is silt loam or loam. The B2 horizon is loam or clay loam and is neutral or mildly alkaline.

Houghton series

The Houghton series consists of deep, very poorly drained soils in potholes on uplands. Permeability is moderately slow to moderately rapid. These soils formed in organic material more than 51 inches thick. Slope ranges from 0 to 2 percent.

Houghton soils are similar to Palms and Wallkill soils and are commonly adjacent to Milford, Patton, and Ragsdale soils. Palms soils developed in organic deposits less than 51 inches thick. Wallkill soils have mineral overwash to a depth of 16 to 40 inches. Milford, Patton, and Ragsdale soils have a mineral solum.

Typical pedon of Houghton muck, undrained, in a cultivated field, 2,700 feet west and 20 feet south of the northeast corner of sec. 17, T. 21 N., R. 2 W.

Oa1—0 to 9 inches; very dark gray (10YR 3/1) sapric material, broken face and rubbed, gray (10YR 5/1) dry; 5 percent fiber, trace rubbed; moderate medium granular structure; friable; 50 percent mineral material; neutral; abrupt wavy boundary.

Oa2—9 to 16 inches; very dark brown (10YR 2/2) sapric material, broken face and rubbed; less than 5 percent fiber, trace rubbed; weak medium subangular blocky structure; friable; 10 percent mineral material; neutral; clear wavy boundary.

Oa3—16 to 21 inches; dark brown (7.5YR 3/2) sapric material, broken face, dark reddish brown (5YR 3/2) rubbed; 10 percent fiber, trace rubbed; moderate medium platy structure; friable; 15 percent mineral material; neutral; abrupt wavy boundary.

Oa4—21 to 34 inches; dark brown (7.5YR 3/2) sapric material, broken face, dark reddish brown (5YR 2/2) rubbed; 15 percent fiber, trace rubbed; moderate medium fine granular structure; very friable; 5 percent mineral material; neutral; clear wavy boundary.

Oa5—34 to 60 inches; dark brown (7.5YR 3/2) sapric material, broken face, dark brown (10YR 4/3) rubbed; 10 percent fiber, trace rubbed; massive; very friable; 5 percent mineral material; neutral.

The organic material is more than 51 inches thick and is slightly acid or neutral. The surface tier is black (10YR 2/1 or N 2/0), very dark brown (10YR 2/2), or very dark gray (10YR 3/1), and is dominantly sapric material. The mineral content ranges from 5 to 60 percent. The bottom tier is dominantly sapric material, but it contains hemic and fibric layers 5 to 8 inches thick in some pedons. Colors below the surface tier include very dark brown (10YR 2/2), black (N 2/0), and dark reddish brown (5YR 2/2 or 5YR 3/2).

Landes series

The Landes series consists of deep, well drained soils on flood plains. Permeability is moderately rapid or rapid. These soils formed in loamy and sandy alluvium. Slope ranges from 0 to 2 percent.

Landes soils are similar to Genesee soils and are commonly adjacent to Ceresco soils. Genesee soils have more clay in the profile between a depth of 10 to 40 inches. Ceresco soils have a gray, mottled subsoil.

Typical pedon of Landes fine sandy loam, in a cultivated field, 2,600 feet west and 200 feet south of the northeast corner of sec. 30, T. 22 N., R. 2 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B21—10 to 18 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; friable; common fine roots; slight effervescence; moderately alkaline; clear wavy boundary.

B22—18 to 30 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; friable; few fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

C—30 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand; single grain; very friable; few fine roots; strong effervescence; moderately alkaline.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. It is silt loam, fine sandy loam, or sandy loam and is neutral or mildly alkaline. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, fine sandy loam, sandy loam, or silt loam and ranges from neutral to moderately alkaline. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma or 3 or 4. It is fine sandy loam, loamy fine sand, or sand and is mildly alkaline or moderately alkaline.

Mahalasville series

The Mahalasville series consists of deep, very poorly drained soils on outwash plains, lake plains, and along drainageways in till plains. Permeability is slow in the subsoil and moderately rapid in the substratum. These soils formed in loess and the underlying stratified sandy, silty, and loamy sediment. Slope ranges from 0 to 2 percent.

Mahalasville soils are similar to Cyclone, Milford, Patton, and Ragsdale soils and are commonly near Martinsville, Starks, and Whitaker soils. Milford and Patton soils do not have an argillic horizon. Ragsdale soils have less sand in the lower part of the solum. Cyclone soils are not stratified and are loam in the lower part of the solum. Martinsville, Starks, and Whitaker soils have an ochric surface layer, a browner subsoil, and are higher in the landscape on swells.

Typical pedon of Mahalasville silty clay loam, in a cultivated field, 1,000 feet north and 200 feet west of the southeast corner of sec. 24, T. 21 N., R. 2 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

A12—9 to 16 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; firm; common roots; many fine pores; neutral; clear smooth boundary.

B21t—16 to 21 inches; very dark gray (N 3/0) silty clay loam, dark gray (10YR 4/1) dry; many medium distinct olive brown (2.5Y 4/4) mottles; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; many fine and medium pores; thin discontinuous very dark gray (10YR 3/1) clay films on faces of prisms; neutral; diffuse wavy boundary.

B22t—21 to 35 inches; gray (10YR 6/1) silty clay loam; many medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few roots; common fine pores; thin continuous dark gray (10YR 4/1) clay films on faces of prisms; neutral; clear smooth boundary.

IIB23t—35 to 40 inches; gray (10YR 5/1) clay loam; many medium and coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 3 percent fine gravel; neutral; gradual wavy boundary.

IIB3t—40 to 44 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/4 and 10YR 5/6) mottles; massive; firm; 5 percent gravel; neutral; gradual wavy boundary.

IIC—44 to 60 inches; gray (10YR 6/1) loam with strata of silt loam and loamy sand; massive; friable; 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 36 to 70 inches thick. Thickness of the silty material ranges from 28 to 50 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is commonly silty clay loam but includes silt loam. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 6, and chroma of less than 4. The Bt horizon is slightly acid or neutral. The IIBt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of less than 3. The IIBt and IIB3t horizons are silt loam, clay loam, or loam and are neutral or mildly alkaline. The IIB3 horizon contains carbonates in some pedons. The C horizon is commonly stratified loam, silt loam, loamy sand, sandy loam, and sand. It ranges from neutral to moderately alkaline and contains carbonates in most pedons.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on stream terraces and glacial moraines. These soils formed in stratified loamy sediment. Slope ranges from 0 to 6 percent.

Martinsville soils are similar to Fox and Ockley soils and are commonly adjacent to Starks and Whitaker soils. Fox and Ockley soils have a C horizon of sand and gravelly coarse sand. Starks and Whitaker soils have a gray, mottled subsoil and are lower in the landscape.

Typical pedon of Martinsville silt loam, 0 to 2 percent slopes, in a cultivated field, 1,000 feet east and 2,565 feet north of the southwest corner of sec. 9, T. 22 N., R. 2 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; common fine and medium pores; neutral; clear smooth boundary.

A2—8 to 10 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; few fine roots; few fine pores; neutral; clear smooth boundary.

B21t—10 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; firm; common fine roots; many fine and medium pores; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; few thin patchy yellowish brown (10YR 5/4) silt coatings on faces of peds; slightly acid; clear smooth boundary.

IIB22t—18 to 34 inches; brown (7.5YR 5/4) clay loam; moderate medium subangular structure; firm; few fine roots; few fine pores; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; 2 percent fine gravel; medium acid; gradual wavy boundary.

IIB23t—34 to 39 inches; reddish brown (5YR 4/4) sandy clay loam; moderate fine subangular blocky structure; firm; few fine roots; thin patchy reddish brown (5YR 4/3) clay films on faces of peds; 5 percent gravel; medium acid; clear wavy boundary.

IIB3t—39 to 58 inches; yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) stratified sandy loam and loamy sand; weak coarse subangular blocky structure; friable; few fine roots; few thin patchy dark brown (7.5YR 4/2) clay films in voids; few thin silt lenses; medium acid; gradual wavy boundary.

IIC—58 to 75 inches; strong brown (7.5YR 5/6) loamy sand; common medium distinct yellowish brown (10YR 5/4) and few reddish brown (5YR 4/3) mottles; massive; friable; slightly acid in the upper part, neutral in the lower 5 inches.

The solum is 40 to 60 inches thick. Loess thickness ranges from 0 to 20 inches. Gravel content in the lower B horizon and the C horizon ranges from 0 to 10 percent.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam, loam, or sandy loam. The B2t and IIB2t horizons have hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 or 6. They are loam, sandy clay loam, silty clay loam, or clay loam and are strongly acid to slightly acid. The B3 horizon ranges from medium acid to neutral. The C horizon is stratified silt loam, loamy sand, sandy loam, coarse silt, and very fine sand. It ranges from slightly acid to moderately alkaline.

Miami series

The Miami series consists of deep, well drained soils on till plains. Permeability is moderate in the subsoil and moderately slow in the underlying material. These soils formed in loess and the underlying glacial till. Slope ranges from 0 to 18 percent.

Miami soils are similar to Russell soils and are commonly adjacent to Crosby, Fincastle, and Treaty soils. Russell soils have less sand and more silt in the subsoil and have a thicker solum. Crosby and Fincastle soils are nearly level and have a yellowish brown, mottled subsoil. Treaty soils have a mollic surface layer, a gray subsoil, and are in swales.

Typical pedon of Miami silt loam, in an area of Miami-Crosby silt loams, 2 to 6 percent slopes, in a cultivated field, 500 feet east and 1,800 feet south of the northwest corner of sec. 1, T. 22 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common fine roots; medium acid; clear smooth boundary.

B21t—8 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; 3 percent gravel; medium acid; clear smooth boundary.

B22t—16 to 25 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; few discontinuous dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear wavy boundary.

B23t—25 to 31 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine pores; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; 3 percent gravel; neutral; clear wavy boundary.

B3t—31 to 36 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; thin patchy dark brown (10YR 3/3) clay films on faces of peds; 10 percent gravel; slight effervesence; mildly alkaline; clear irregular boundary.

C—36 to 60 inches; brown (10YR 5/3) loam; massive; firm; 10 percent gravel; strong effervesence; moderately alkaline.

The solum is 26 to 42 inches thick. The loess layer ranges from 0 to 18 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or silt loam. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The upper part of the B2t horizon is clay loam or silty clay loam and ranges from strongly acid to neutral. The lower part is loam, clay loam, or sandy clay loam and ranges from medium acid to neutral. The B3 horizon ranges from slightly acid to mildly alkaline and contains carbonates in some profiles. The C horizon is firm loam in most areas but in some morainal areas it is friable sandy loam or loam.

Milford series

The Milford series consists of deep, very poorly drained soils in potholes on lakebeds and till plains and along drainageways. Permeability is slow in the subsoil and moderately slow in the underlying material. These soils formed in stratified silty and clayey sediment. Slope ranges from 0 to 2 percent.

Milford soils are similar to Mahalasville, Patton, and Ragsdale soils and are commonly near Starks and Whitaker soils. Mahalasville, Patton, and Ragsdale soils have less clay in the subsoil and are usually on slightly higher positions in the landscape. Starks and Whitaker soils have an ochric surface layer, are on higher-lying positions, and have a browner subsoil.

Typical pedon of Milford silty clay loam, in a cultivated field, 1,350 feet south and 100 feet west of the northeast corner of sec. 9, T. 22 N., R. 1 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; many fine roots; slightly acid; abrupt smooth boundary.

A3—10 to 17 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; few medium distinct olive brown (2.5Y 4/4) mottles; weak medium subangular structure; firm; few fine roots; neutral; clear smooth boundary.

B21g—17 to 22 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; many medium distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; very firm; few fine roots; few fine pores; neutral; clear smooth boundary.

B22g—22 to 31 inches; gray (10YR 5/1) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; few fine and medium pores; common discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; common discontinuous dark grayish brown (10YR 4/2) clay coatings lining pores; neutral; clear smooth boundary.

B3g—31 to 38 inches; gray (10YR 5/1) silt loam containing thin strata of silty clay loam; many

medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; few fine pores; thin patchy dark grayish brown (10YR 4/2) clay coatings on ped faces and in channels; few small shells; slight effervescence; mildly alkaline; abrupt smooth boundary.

C—38 to 60 inches; gray (10YR 5/1) silt loam containing thin strata of silty clay loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silty clay. The B2 horizon has hue of 10YR or 2.5Y, value of 3 or 4 in the upper part and value of 4 to 6 in the lower part, and chroma of less than 2. It is silty clay loam, clay loam, or silty clay. The B3 horizon has colors similar to those of the B2 horizon and is silty clay loam, silty clay, clay loam, or silt loam. The C horizon is stratified silty clay loam, silt loam, and sand. It ranges from neutral to moderately alkaline and contains carbonates in most pedons.

Ockley series

The Ockley series consists of deep, well drained soils on terraces. Permeability is moderate in the solum and very rapid in the underlying material. These soils formed in loamy outwash over sand and gravel. Slope ranges from 0 to 6 percent.

Ockley soils are similar to Fox soils and are commonly near Martinsville and Sleeth soils. Fox soils have sand and gravelly sand at a depth of less than 40 inches. Martinsville soils have a C horizon of stratified loamy, silty, and sandy sediment. Sleeth soils have a gray, mottled subsoil and are on slightly lower positions.

Typical pedon of Ockley silt loam, 2 to 6 percent slopes, in a pasture, 1,636 feet south and 200 feet west of the northeast corner of sec. 30, T. 22 N., R. 1 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine and medium granular structure; friable; slightly acid; many roots; common pores; clear smooth boundary.

B1—6 to 9 inches; brown (10YR 5/3) silt loam; weak medium granular structure; friable; many fine roots; few fine pores; slightly acid; clear smooth boundary.

B21t—9 to 16 inches; brown (7.5YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

IIB22t—16 to 25 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; common fine roots; common fine pores; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt coatings on faces of peds; 8 percent gravel in lower part of horizon; medium acid; gradual wavy boundary.

IIB23t—25 to 38 inches; dark brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; dark reddish brown (5YR 3/3) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt coatings on faces of peds; 18 percent gravel; medium acid; clear wavy boundary.

IIB24—38 to 44 inches; reddish brown (5YR 4/3) gravelly sandy clay loam; weak coarse subangular blocky structure; firm; common roots; thin reddish brown (5YR 4/3) clay films on faces of peds; few thin light brownish gray (10YR 6/2) silt coatings on faces of peds; 20 percent gravel; medium acid; clear wavy boundary.

IIB3t—44 to 51 inches; dark reddish brown (5YR 3/2) gravelly sandy clay loam; massive; common roots; 15 percent gravel; neutral; gradual irregular boundary.

IIIC—51 to 60 inches; brown (10YR 5/3) very gravelly coarse sand; loose; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. Loess thickness is less than 20 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or silty clay loam. Gravel content ranges from 0 to 15 percent. The B2t horizon is medium acid or slightly acid. The IIB2t horizon is clay loam or sandy clay loam or their gravelly analogs. Gravel content ranges from 15 to 30 percent. The IIB2t horizon ranges from medium acid to neutral. The IIB3 horizon has hue of 7.5YR or 5YR, value of 2 or 3, and chroma of 2 or 3. It is sandy clay loam, clay loam, or sandy loam, or their gravelly analogs.

Palms series

The Palms series consists of deep, very poorly drained soils in potholes on uplands and terraces and in swales on flood plains. Permeability is moderately slow to moderately rapid in the organic layers and moderate or moderately slow in the mineral material. These soils formed in organic material overlying loamy material. Slope ranges from 0 to 2 percent.

Palms soils are similar to Houghton and Wallkill soils and are in topographic positions similar to Milford and Sloan soils. Houghton soils formed in organic material more than 51 inches thick. Wallkill soils have 16 to 40 inches of mineral overwash over organic material. Milford soils have a clayey solum. Sloan soils have a loamy solum.

Typical pedon of Palms muck, undrained, in an abandoned crop field, 1,900 feet west and 2,600 feet

south of the northeast corner of sec. 32, T. 20 N., R. 2 W.

Oa1—0 to 12 inches; black (N 2/0) sapric material, broken face and rubbed, very dark gray (N 3/0) dry; less than 1 percent fiber, trace rubbed; weak coarse subangular blocky structure parting to moderate medium granular; very friable; many fine roots; 40 percent mineral material; neutral; clear smooth boundary.

Oa2—12 to 26 inches; very dark gray (N 3/0) sapric material, broken face and rubbed, very dark gray (10YR 3/1) dry; less than 10 percent fiber, trace rubbed; massive; friable; common roots; few pores; 1 percent fine gravel; 20 percent mineral material; neutral; clear wavy boundary.

IIC1g—26 to 30 inches; dark gray (N 4/0) silt loam; 1 percent fiber, trace rubbed; massive; firm; 3 percent fine gravel; neutral; clear wavy boundary.

IIC2g—30 to 60 inches; dark gray (N 4/0) loam; massive; firm; 10 percent gravel; mildly alkaline; abrupt smooth boundary.

The organic deposits are 16 to 50 inches thick and are slightly acid or neutral. The surface tier is black (10YR 2/1 or N 2/0) or very dark brown (10YR 2/2). The subsurface and bottom tiers have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2, or are neutral and have value of 2 or 3. The surface and bottom tiers are dominantly sapric material, but they contain hemic layers less than 10 inches thick and a few wood fragments. The mineral content of the organic horizons ranges from 10 to 40 percent. The IIC horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2, or is neutral and has value of 4 to 6. It is loam, silt loam, clay loam, or sandy loam.

Parr series

The Parr series consists of deep, well drained soils on glacial till plains. Permeability is moderate in the solum and moderately slow in the underlying till. These soils formed in loess and the underlying till. Slope ranges from 1 to 5 percent.

Parr soils are similar to Miami soils and are commonly near Dana, Drummer, and Raub soils. Miami soils have an ochric surface layer. Dana and Raub soils have gray mottles in the subsoil. Drummer soils have a gray subsoil and are in swales.

Typical pedon of Parr silt loam, 1 to 5 percent slopes, in a pasture, 200 feet west and 1,350 feet north of the southeast corner of sec. 17, T. 21 N., R. 2 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

IIB21t—10 to 18 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common fine roots; few pores; 3 percent gravel; medium acid; clear smooth boundary.

IIB22t—18 to 24 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; few fine roots; common fine pores; 7 percent gravel; medium acid; gradual wavy boundary.

IIB23t—24 to 34 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds; few roots; few pores; 5 percent gravel; slightly acid; gradual wavy boundary.

IIB3t—34 to 37 inches; strong brown (7.5YR 5/6) clay loam; weak coarse subangular blocky structure; firm; thin patchy dark brown (7.5YR 3/2) clay films on faces of peds; moderately alkaline; slight effervescence; gradual wavy boundary.

IIC—37 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick. Loess thickness ranges from 0 to 18 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2. It is silt loam or loam. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or loam and includes silty clay loam in the upper part. It is medium acid or slightly acid.

Patton series

The Patton series consists of deep, poorly drained, moderately permeable soils in depressions on lake plains and till plains. These soils formed in lacustrine silt and clay. Slope ranges from 0 to 2 percent.

Patton soils are similar to Drummer, Mahalasville, and Ragsdale soils and are commonly adjacent to Fincastle, Raub, and Starks soils. Drummer and Mahalasville soils have more sand in the lower part of the solum. Ragsdale soils have an argillic horizon. Fincastle and Starks soils have an ochric surface layer and are on swells. Raub soils have a browner subsoil and are on swells.

Typical pedon of Patton silty clay loam, in a cultivated field, 350 feet west and 200 feet north of the southeast corner of sec. 15, T. 22 N., R. 1 E.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 12 inches; very dark gray (10YR 3/1) silty clay loam, very dark gray (10YR 3/1) dry; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak

coarse subangular blocky structure; firm; neutral; abrupt wavy boundary.

B2—12 to 19 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin patchy dark gray (10YR 4/1) clay and organic flows; neutral; gradual wavy boundary.

B3—19 to 30 inches; gray (10YR 5/1) silty clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; slight effervescence; mildly alkaline; gradual wavy boundary.

C1—30 to 52 inches; gray (10YR 6/1) silt loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—52 to 60 inches; gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 24 to 42 inches thick.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam or silty clay loam and averages 25 to 35 percent clay content. The B3 horizon is neutral or mildly alkaline and contains carbonates in many profiles. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is silt loam or silty clay loam and ranges from neutral to moderately alkaline.

Proctor series

The Proctor series consists of deep, moderately well drained soils on outwash plains and lake plains. Permeability is moderate in the subsoil and moderately rapid in the underlying material. These soils formed in loess and the underlying silty and sandy sediment. Slope ranges from 0 to 3 percent.

Proctor soils are similar to Dana and Parr soils and are commonly near Brenton soils. Dana soils are not stratified in the lower part of the solum and in the C horizon. Parr soils have a thinner solum. Brenton soils have a grayer, mottled subsoil.

Typical pedon of Proctor silt loam, 0 to 3 percent slopes, in a cultivated field, 420 feet west and 330 feet north of the southeast corner of sec. 30, T. 21 N., R. 1 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; common fine roots; many fine pores; strongly acid; abrupt smooth boundary.

B1—11 to 16 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common fine roots; many fine pores lined with black (10YR 2/1) silty clay loam; common thin discontinuous very dark gray (10YR 3/1) clay coatings on faces of peds; strongly acid; gradual smooth boundary.

B21t—16 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; firm; moderate medium subangular blocky structure; firm; common roots; many fine pores lined with very dark gray (10YR 3/1) organic stains; continuous dark brown (10YR 4/3) clay coatings on faces of peds; strongly acid; clear smooth boundary.

B22t—25 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common roots; many fine pores lined with very dark gray (10YR 3/1) organic stains; thin discontinuous dark brown (10YR 4/3) clay coatings on faces of peds; strongly acid; gradual smooth boundary.

IIB23t—33 to 57 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; weak coarse subangular blocky structure; firm; few fine roots; many fine and medium pores; thin patchy dark brown (10YR 4/3) clay coatings on faces of peds; strongly acid; gradual smooth boundary.

IIB3—57 to 65 inches; yellowish brown (10YR 5/6) loam; common medium distinct brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; few roots; many fine and medium pores; few patchy dark brown (7.5YR 4/4) clay coatings on faces of peds; slightly acid; gradual smooth boundary.

IIC—65 to 70 inches; strong brown (7.5YR 5/8) stratified loamy sand and sand; single grained; loose; slightly acid.

The solum is 45 to 70 inches thick. Loess thickness ranges from 28 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The B2t horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 to 6. It is neutral to strongly acid. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is clay loam, loam, or sandy clay loam and is strongly acid to slightly acid. The IIC horizon is stratified silt loam, loam, sandy loam, and thin sandy and gravelly layers. It ranges from slightly acid to mildly alkaline.

Ragsdale series

The Ragsdale series consist of deep, very poorly drained, slowly permeable soils on upland till plains. These soils formed in loess. Slope ranges from 0 to 2 percent.

Ragsdale soils are similar to Cyclone, Drummer, Mahalasville, Patton, and Treaty soils and are commonly near Fincastle and Reesville soils. Cyclone, Drummer,

Mahalasville, and Treaty soils have more sand in the lower part of the solum. Patton soils do not have an argillic horizon and formed in lacustrine sediment. Fincastle soils have an ochric surface layer and are on swells. Reesville soils have an ochric surface layer, a browner subsoil, and are on swells.

Typical pedon of Ragsdale silt loam, in a cultivated field, 350 feet east and 2,565 feet south of the northwest corner of sec. 23, T. 21 N., R. 2 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—8 to 14 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; few fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular structure; friable; common fine roots; common fine pores; neutral; abrupt smooth boundary.

B21tg—14 to 19 inches; dark gray (10YR 4/1) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/4) mottles; weak fine and medium subangular blocky structure; firm; common fine roots; common fine pores; thin discontinuous black (10YR 2/1) clay films on faces of peds; neutral; clear wavy boundary.

B22tg—19 to 25 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common fine pores; continuous dark gray (10YR 4/1) clay films on faces of peds and in root channels; neutral; clear wavy boundary.

B23tg—25 to 35 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky and angular blocky; firm; few fine roots; common fine pores; thick continuous dark gray (10YR 4/1) clay films on faces of peds and in root channels; neutral; gradual wavy boundary.

B31g—35 to 41 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; common fine pores; thin discontinuous gray (10YR 5/1) clay films in root channels; neutral; gradual wavy boundary.

B32g—41 to 50 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; thin discontinuous gray (10YR 5/1) clay films in root channels; slight effervescence; mildly alkaline; gradual wavy boundary.

C—50 to 60 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silty clay loam or silt loam. The upper part of the B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. The lower part of the B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4, and is silty clay loam or silt loam. The B2t horizon is slightly acid or neutral. The B3 horizon is neutral or mildly alkaline and contains carbonates in many profiles. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 6.

Raub series

The Raub series consists of deep, somewhat poorly drained soils on glacial till plains. Permeability is moderately slow. These soils formed in loess and the underlying till. Slope ranges from 0 to 2 percent.

Raub soils are similar to Brenton and Dana soils and are commonly near Drummer and Parr soils. Brenton soils have a stratified substratum. Dana soils do not have mottles in the upper part of the subsoil. Drummer soils have a grayer subsoil and are in depressions. Parr soils have a browner subsoil and are on rises.

Typical pedon of Raub silt loam, 200 feet west and 2,200 feet south of the northeast corner of sec. 36, T. 21 N., R. 2 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 11 inches; very dark brown (10YR 2/2) silt loam; moderate medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

B21t—11 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (2.5Y 5/2) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; many discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; many fine roots; common fine pores; slightly acid; clear wavy boundary.

B22t—17 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many continuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; many fine roots; many fine pores; medium acid; clear wavy boundary.

B23t—29 to 35 inches; light olive brown (2.5Y 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic

structure parting to moderate medium subangular blocky; firm; few discontinuous distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common discontinuous dark grayish brown (10YR 4/2) and thin patchy very dark brown (10YR 2/2) clay films on faces of peds and in voids; few fine roots; many fine and medium pores; slightly acid; clear wavy boundary.

IIB24t—35 to 46 inches; yellowish brown (10YR 5/6) clay loam; many medium distinct gray (10YR 6/1) mottles; weak medium and coarse subangular blocky structure; friable; few patchy very dark grayish brown (10YR 3/2) organic coatings and clay films on faces of peds; thin patchy dark grayish brown (10YR 4/2) clay films lining some pores; neutral; gradual wavy boundary.

IIC—46 to 60 inches; yellowish brown (10YR 5/4) loam; many medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 37 to 70 inches thick. Loess thickness ranges from 24 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. Mottles with chroma of 2 or less are present within 6 inches of the base of the mollic epipedon. The B2 horizon is slightly acid to strongly acid. The IIB2 horizon is clay loam or loam. It is slightly acid or neutral. The IIB3 horizon, where present, is neutral or mildly alkaline and contains carbonates in some profiles.

Reesville series

The Reesville series consists of deep, somewhat poorly drained, moderately permeable soils on till plains. These soils formed in loess. Slope ranges from 0 to 2 percent.

Reesville soils are similar to Fincastle and Starks soils and are commonly adjacent to Ragsdale and Xenia soils. Fincastle and Starks soils have more sand in the lower part of the solum. Ragsdale soils have a mollic surface layer and are in swales. Xenia soils have more sand in the lower part of the solum and are on side slopes and summits.

Typical pedon of Reesville silt loam, in a cultivated field, 792 feet south and 1,452 feet east of the northwest corner of sec. 16, T. 20 N., R. 2 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 10 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

B1t—10 to 15 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; firm; many roots; many fine pores; few thin grayish brown (10YR 5/2) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt coatings on faces of peds; few soft iron and manganese oxide accumulations; medium acid; gradual smooth boundary.

B21t—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many roots; many medium pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few thin light brownish gray (10YR 6/2) silt coatings on faces of peds; few soft black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual wavy boundary.

B22t—21 to 30 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and common medium faint light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; many fine and medium pores; thick continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thick continuous very dark gray (10YR 3/1) clay films in root channels and pores; few soft black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual wavy boundary.

B3t—30 to 38 inches; light olive brown (2.5Y 5/4) silt loam; many medium prominent light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; common fine roots; many fine and medium pores; thin patchy very dark gray (10YR 3/1) clay films in pores and on faces of peds; few soft black (10YR 2/1) iron and manganese oxide accumulations; few calcium carbonate nodules; neutral; gradual wavy boundary.

C—38 to 60 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 48 inches thick.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is medium acid to neutral. The B3 horizon is slightly acid to mildly alkaline and contains carbonates in a few profiles. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6.

Russell series

The Russell series consists of deep, well drained, moderately permeable soils on till plains. These soils

formed in loess and the underlying till. Slope ranges from 2 to 6 percent.

Russell soils are similar to Camden Variant and Miami soils and are commonly adjacent to Fincastle and Xenia soils. Camden Variant soils have horizons developed from loamy outwash in the lower part of the subsoil. Miami soils have a fine-loamy control section. Fincastle and Xenia soils have gray mottles in the subsoil and are on nearly level swells.

Typical profile of Russell silt loam, 2 to 6 percent slopes, in a cultivated field, 650 feet north and 1,200 feet east of the southwest corner of sec. 22, T. 22 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; many fine roots; common fine and medium pores; medium acid; clear wavy boundary.

B21t—12 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; common fine and medium pores; thin continuous brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; gradual wavy boundary.

IIB22t—26 to 39 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thin patchy pale brown (10YR 6/3) silt coatings on faces of peds; 5 percent gravel; medium acid; gradual wavy boundary.

IIB23t—39 to 53 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; many fine and medium pores; thin patchy brown (7.5YR 4/4) clay films on faces of peds; 5 percent gravel; medium acid; gradual wavy boundary.

IIB3t—53 to 68 inches; brown (10YR 4/3) clay loam; weak coarse subangular blocky structure; firm; common fine and medium pores; dark brown (7.5YR 3/2) clay films lining few pores; 5 percent gravel; neutral.

The solum is 50 to 70 inches thick. Loess thickness ranges from 24 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. The IIB2t horizon has similar colors and is clay loam or loam. It ranges from medium acid to neutral. The IIB3 horizon is loam or clay loam. It ranges from slightly acid to mildly alkaline and contains carbonates in some profiles.

Sable series

The Sable series consists of deep, poorly drained, moderately permeable soils on till plains. These soils formed in loess. Slope ranges from 0 to 2 percent.

Sable soils are similar to Cyclone, Drummer, Mahalasville, Patton, and Ragsdale soils and are commonly near Brenton and Raub soils. Cyclone, Drummer, and Mahalasville soils have more sand in the lower part of the solum. Patton soils have a thinner solum, a stratified substratum, and formed in lacustrine sediment. Ragsdale soils have an argillic horizon. Brenton and Raub soils have a browner subsoil and are on nearly level swells.

Typical pedon of Sable silty clay loam, in a cultivated field, 600 feet west and 1,520 feet north of the southeast corner of sec. 32, T. 21 N., R. 1 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, black (10YR 2/1) dry; moderate medium granular structure; firm; neutral; abrupt smooth boundary.

A12—9 to 16 inches; black (10YR 2/1) silty clay loam, black (10YR 2/1) dry; few medium distinct olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; many fine roots; common fine pores; neutral; clear smooth boundary.

B21g—16 to 27 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; many fine and medium pores; thin discontinuous dark gray (10YR 4/1) clay and organic flows in root channels and pores; few calcium carbonate nodules up to 1/2 inch across; neutral; clear smooth boundary.

B22g—27 to 33 inches; gray (10YR 5/1) silty clay loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; many fine roots; common medium pores; thin patchy dark gray (10YR 4/1) clay flows in root channels and pores; few calcium carbonate nodules; mildly alkaline; clear wavy boundary.

B23g—33 to 42 inches; light gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common medium pores; mildly alkaline; clear wavy boundary.

B3—42 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; many medium and coarse distinct gray (10YR 6/1) mottles; weak medium subangular blocky structure; firm; common fine pores; slight effervescence; mildly alkaline; gradual wavy boundary.

C—48 to 60 inches; gray (10YR 6/1) silt loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; mildly alkaline.

The solum is 36 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is commonly silty clay loam but includes silt loam. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2, and is neutral or mildly alkaline. The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is silty clay loam or silt loam, is neutral or mildly alkaline, and contains carbonates in many profiles. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 6.

Saranac series

The Saranac series consists of deep, very poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty and clayey sediment. Slope ranges from 0 to 2 percent.

Saranac soils are similar to Milford, Sloan, and Mahalasville soils and are commonly near Palms soils. Milford soils are not on flood plains. Sloan soils have less clay in the solum. Mahalasville soils have an argillic horizon and a stratified substratum. Palms soils have an organic surface layer.

Typical pedon of Saranac silty clay loam, in a cultivated field, 1,600 feet east and 800 feet south of the northwest corner of sec. 5, T. 20 N., R. 2 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium and fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A12—9 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular and angular blocky structure; firm; many fine roots; neutral; clear wavy boundary.

B21g—16 to 22 inches; gray (10YR 5/1) silty clay; many medium distinct olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; few thin black (10YR 2/1) organic coatings on faces of peds; neutral; clear smooth boundary.

B22g—22 to 37 inches; dark gray (10YR 4/1) and gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few thin black (10YR 2/1) organic coatings on faces of peds; neutral; clear smooth boundary.

B3g—37 to 49 inches; gray (10YR 5/1) silty clay loam; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; firm; neutral; clear wavy boundary.

C—49 to 60 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; thin strata of silt loam and silty clay; neutral.

The solum is 40 to 60 inches thick.

The A horizon is black (10YR 2/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2) silty clay loam or silt loam. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or silty clay. The B3 horizon has similar colors to the B2 horizon. It is silty clay loam, silty clay, clay loam, or silt loam. The B3 horizon is neutral or mildly alkaline and contains carbonates in some profiles. The C horizon is stratified silty clay loam, silt loam, clay loam, sandy loam, and sand. It ranges from neutral to moderately alkaline and contains carbonates in some profiles.

Sleeth series

The Sleeth series consists of deep, somewhat poorly drained soils on outwash plains. Permeability is moderate in the subsoil and very rapid in the underlying material. These soils formed in loamy outwash underlain by sand and gravel. Slope ranges from 0 to 2 percent.

Sleeth soils are similar to Starks and Whitaker soils and are commonly adjacent to Ockley and Westland soils. Starks and Whitaker soils have less gravel in the lower part of the solum. Ockley soils have a brown, mottle-free subsoil. Westland soils have a mollic surface layer, a grayer subsoil, and are in swales.

Typical pedon of Sleeth silt loam, in a cultivated field, 700 feet east and 1,700 feet north of the southwest corner of sec. 29, T. 22 N., R. 1 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—9 to 12 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; fine granular structure; friable; slightly acid; clear smooth boundary.

B21t—12 to 23 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions; 10 percent gravel; medium acid; clear wavy boundary.

B22t—23 to 38 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; few fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions; 15 percent gravel; medium acid; clear wavy boundary.

B3t—38 to 50 inches; grayish brown (10YR 5/2) gravelly clay loam; many medium distinct yellowish brown

(10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds and as linings in channels; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; 20 percent gravel; slightly acid; abrupt wavy boundary.

C1—50 to 58 inches; grayish brown (10YR 5/2) loamy coarse sand; many coarse distinct yellowish brown (10YR 5/6) mottles; loose; 15 percent gravel; neutral; gradual wavy boundary.

IIC2—58 to 80 inches; yellowish brown (10YR 5/4) sand and gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. Loess thickness is less than 20 inches.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. It is dominantly silt loam but includes loam. The B2t horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is silty clay loam or clay loam in the upper part and clay loam or sandy clay loam or their gravelly analogs in the lower part. The B2t horizon is medium acid or slightly acid. The C horizon has hue of 10YR, value of 5, and chroma of 2 to 4. The upper part of the C horizon lacks gravel in some pedons.

Sloan series

The Sloan series consists of deep, very poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. Slope ranges from 0 to 2 percent.

Sloan soils are similar to Westland soils and are commonly adjacent to Ceresco and Genesee soils. Westland soils have an argillic horizon, more gravel in the solum, and underlying material of sand and gravel. Ceresco soils have a browner, less clayey subsoil. Genesee soils have a browner subsoil.

Typical pedon of Sloan silt loam, in a cultivated field, 200 feet west and 1,330 feet north of the southeast corner of sec. 17, T. 22 N., R. 1 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A12—9 to 13 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

B21g—13 to 25 inches; dark gray (10YR 4/1) loam; many fine distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy very dark gray (10YR 3/1) organic coatings on faces of peds; 2 percent fine gravel; neutral; gradual smooth boundary.

B22g—25 to 31 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6) and olive brown (2.5Y 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; 5 percent fine gravel; neutral; gradual smooth boundary.

B23g—31 to 38 inches; grayish brown (10YR 5/2) clay loam; many medium distinct light olive brown (2.5Y 5/6) and common medium distinct dark gray (10YR 4/1) mottles; moderate medium subangular blocky structure; firm; 5 percent fine gravel; neutral; gradual smooth boundary.

B3g—38 to 50 inches; gray (10YR 5/1) clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; 3 percent fine gravel; neutral; gradual wavy boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) loam containing thin strata of sand; many medium distinct grayish brown (10YR 5/2) mottles; massive; firm; neutral.

The solum is 30 to 50 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2, or is neutral and has value of 2 or 3. It is loam, silty clay loam, silt loam, or clay loam. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2, or is neutral and has value of 4 or 5. It is clay loam, silty clay loam, loam, or silt loam and is slightly acid or neutral. The C horizon has hue of 10YR or 2.5YR, value of 4 to 6, and chroma of 1 to 4. It is silty clay loam, sand, loam, sandy loam, or loamy sand. The C horizon contains carbonates in a few profiles.

Starks series

The Starks series consists of deep, somewhat poorly drained soils on lakebeds and till plains. Permeability is moderately slow or moderate in the subsoil and moderately rapid in the substratum. These soils formed in loess and the underlying loamy sediment. Slope ranges from 0 to 2 percent. These soils have more clay in the subsoil than is defined for the Starks series, but this difference does not alter their usefulness and behavior.

Starks soils are similar to Fincastle, Reesville, and Whitaker soils and are commonly near Cyclone and Mahalasville soils. Fincastle soils are not stratified in the solum and have a till substratum. Reesville soils have less sand in the lower part of the solum. Whitaker soils have more sand in the subsoil. Cyclone and Mahalasville soils have a mollic surface layer, a grayer subsoil, and are in depressions.

Typical pedon of Starks silt loam, in a cultivated field, 2,635 feet west and 2,300 feet south of the northeast corner of sec. 8, R. 1 E., T. 22 N.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; few black (10YR 2/1) iron and manganese oxide accumulations; neutral; abrupt smooth boundary.

B1t—10 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; weak fine and very fine prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; few fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; many thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; clear smooth boundary.

B21t—18 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common fine roots along prism faces; few very fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide concretions and stains; strongly acid; gradual wavy boundary.

IIB22t—28 to 38 inches; yellowish brown (10YR 5/4) sandy clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; few fine pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; clean grayish brown (10YR 5/2) sand grains on faces of peds; strongly acid; gradual wavy boundary.

IIB23t—38 to 43 inches; grayish brown (10YR 5/2) fine sandy loam; many medium distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine and medium pores; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear smooth boundary.

IIB31—43 to 49 inches; yellowish brown (10YR 5/4) fine sandy loam; many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine and medium pores; thin patchy gray (10YR 5/1) clay films on faces of peds; slightly acid; clear wavy boundary.

IIB32—49 to 55 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin patchy gray (10YR 5/1) clay films on faces of peds; common fine and medium pores; neutral; clear smooth boundary.

IIC—55 to 67 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct grayish brown (10YR 5/2) mottles; massive; friable; slight effervescence; mildly alkaline.

The solum is 40 to 70 inches thick. Loess thickness ranges from 25 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The IIBt horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is sandy loam, sandy clay loam, loam, silt loam, silty clay loam, or clay loam. The Bt and IIBt horizons range from very strongly acid to neutral. The C horizon is commonly stratified silt loam, loamy sand, and sandy loam. It is neutral to moderately alkaline.

Treaty series

The Treaty series consists of deep, poorly drained, moderately permeable soils on till plains. These soils formed in loess and the underlying loam till. Slope ranges from 0 to 2 percent.

Treaty soils are similar to Cyclone, Mahalasville, and Ragsdale soils and are commonly adjacent to Fincastle and Crosby soils. Cyclone soils have a thicker silty clay loam subsoil. Mahalasville soils have a stratified sand and silt substratum. Ragsdale soils have less sand in the lower part of the solum. Fincastle and Crosby soils have an ochric surface layer and are on slight rises.

Typical pedon of Treaty silt loam, in a cultivated field, 1,500 feet east and 900 feet north of the southwest corner of sec. 11, T. 22 N., R. 2 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

A12—9 to 13 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; firm; common roots; many fine and medium pores; neutral; clear smooth boundary.

B21t—13 to 22 inches; dark gray (10YR 4/1) silty clay loam; common fine and medium distinct olive brown (2.5Y 4/4) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; many fine and medium pores; common roots between prisms; neutral; gradual wavy boundary.

B22t—22 to 30 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; common fine roots between prisms; many fine pores; neutral; gradual wavy boundary.

B23t—30 to 36 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; few very dark grayish brown (10YR 3/2) clay flows in old root channels; common fine roots between prisms; common fine pores; neutral; gradual wavy boundary.

IIB24t—36 to 53 inches; gray (10YR 5/1) clay loam containing some thin sandy loam layers in the lower part; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky

structure; firm; few fine roots; few fine pores; thin discontinuous dark gray (10YR 4/1) clay films; neutral; gradual wavy boundary.

IIB3t—53 to 64 inches; yellowish brown (10YR 5/6) clay loam; many coarse distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIC—64 to 70 inches; yellowish brown (10YR 5/4) loam; massive; firm; few very dark gray (10YR 3/1) clay flows in root channels; strong effervescence; moderately alkaline.

The solum is 45 to 64 inches thick. Loess thickness ranges from 24 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. The upper part of the B2t horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 1 to 3. It is neutral or slightly acid. The IIB2t horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4. The IIB3 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, loam, or sandy clay loam. Thin layers of coarse textured material are present in the IIB3 horizon in some profiles. The IIB3 horizon is neutral or mildly alkaline.

Wallkill series

The Wallkill series consists of deep, very poorly drained soils in potholes on flood plains and upland till plains. Permeability is moderate in the mineral portion and moderately rapid in the organic portion. These soils formed in colluvium and the underlying organic material. Slope ranges from 0 to 2 percent.

Wallkill soils are similar to Houghton and Palms soils and are adjacent to Milford and Patton soils. Houghton soils have the entire solum developed in organic material. Palms soils developed in 16 to 50 inches of organic material over loamy mineral material. Milford and Patton soils have a mineral solum.

Typical pedon of Wallkill silt loam, in a cultivated field, 900 feet east and 100 feet south of the northwest corner of sec. 30, T. 23 N., R. 2 W.

Ap—0 to 9 inches; dark grayish brown (2.5Y 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; medium acid; clear smooth boundary.

A12—9 to 17 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse subangular blocky structure; friable; common roots; few fine pores; medium acid; gradual wavy boundary.

B2—17 to 22 inches; grayish brown (10YR 5/2) silt loam; common fine and medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; massive; firm; common roots; few fine pores; medium acid; clear smooth boundary.

IIOa1—22 to 31 inches; black (10YR 2/1) sapric material rubbed; less than 5 percent fiber, trace when rubbed; massive; friable; common roots; few fine pores; light olive brown (2.5Y 5/6) organic particles; many thick continuous yellowish brown (10YR 5/4) vertical iron stains and silt coatings; slightly acid; gradual wavy boundary.

IIOa2—31 to 52 inches; black (10YR 2/1) sapric material rubbed; 5 percent fiber, trace when rubbed; fiber content increases to 10 percent below a depth of 40 inches, trace when rubbed; massive; friable; common roots; medium acid; diffuse irregular boundary.

IIIC—52 to 60 inches; dark grayish brown (2.5Y 4/2) and gray (10YR 6/1) silt loam having 1- to 3-inch layers of muck; common medium distinct olive brown (2.5Y 4/4) mottles; massive; friable; slightly acid.

The thickness of the mineral soil over organic material ranges from 16 to 40 inches. The A horizon is silt loam or loam. It has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 or 2. The B2 horizon has hue of 10YR, 2.5Y, or 5Y; value of 2 to 5; and chroma of 1 or 2. It is silt loam, loam, clay loam, or silty clay loam. The IIIC horizon has colors and texture similar to the B horizon. The mineral horizons are neutral to medium acid.

The total thickness of the underlying organic horizons ranges from 20 to more than 60 inches. These underlying horizons have hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2, or are neutral and have value of 2 to 4. The O horizon is mostly sapric but includes some hemic layers.

Westland series

The Westland series consists of deep, very poorly drained soils on broad terraces and in drainageways. Permeability is slow in the subsoil and very rapid in the underlying material. These soils formed in loamy outwash over sand and gravel. Slope ranges from 0 to 2 percent.

Westland soils are similar to Treaty and Sloan soils and are commonly near Ockley and Sleeth soils. Treaty soils have less gravel in the lower part of the solum. Sloan soils are on flood plains and do not have an argillic horizon. Ockley and Sleeth soils have an ochric surface layer, a browner subsoil, and are on slightly higher-lying positions.

Typical pedon of Westland silty clay loam, in a cultivated field, 400 feet north and 1,520 feet west of the southeast corner of sec. 5, T. 20 N., R. 1 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; few roots; slightly acid; abrupt smooth boundary.

A12—9 to 16 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; few roots; many fine and medium pores; 3 percent fine gravel; slightly acid; clear wavy boundary.

B21tg—16 to 28 inches; dark gray (10YR 4/1) clay loam; many medium distinct dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; many thin continuous very dark gray (10YR 3/1) clay coatings on faces of peds; 10 percent fine gravel; neutral; clear wavy boundary.

B22tg—28 to 46 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few roots; common fine and medium pores; many continuous very dark gray (10YR 3/1) clay coatings on faces of peds; black (10YR 2/1) clay loam filling and lining krotovinas; 10 percent fine gravel; neutral; clear wavy boundary.

B3t—46 to 54 inches; dark gray (N 4/0) gravelly clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; massive; firm; 20 percent fine gravel; neutral; abrupt irregular boundary.

C—54 to 60 inches; gray (10YR 5/1) sand and gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, loam, or clay loam. The Bt horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 1 or 2, or is neutral and has value of 4 or 5. It is silty clay loam, clay loam, or gravelly clay loam and is slightly acid or neutral. The C horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 1 or 2, or is neutral and has value of 4 or 5.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained soils on terraces and till plains. Permeability is moderate in the subsoil and moderate to moderately rapid in the underlying material. These soils formed in loamy and silty sediment. Slope ranges from 0 to 2 percent.

Whitaker soils are similar to Starks soils and are commonly near Mahalasville and Patton soils. Starks soils have a fine-silty control section. Mahalasville and Patton soils have a mollic surface layer and are in low-lying depressions.

Typical pedon of Whitaker silt loam, in a cultivated field, 350 feet east and 1,750 feet north of the southwest corner of sec. 14, T. 22 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate fine granular structure; friable; many roots; neutral; abrupt smooth boundary.

A2—8 to 10 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine granular structure; friable; many roots; many fine pores; slightly acid; clear smooth boundary.

B1t—10 to 14 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few roots; common fine pores; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; common thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear smooth boundary.

B21t—14 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; common fine pores; thin continuous grayish brown (10YR 5/2) clay films and common thin patchy light brownish gray (10YR 6/2) silt coatings on faces of peds; few clean sand grains; strongly acid; clear smooth boundary.

IIB22t—19 to 31 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; common roots; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; many clean sand grains; strongly acid; clear smooth boundary.

IIB23t—31 to 38 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear wavy boundary.

IIB3—38 to 44 inches; yellowish brown (10YR 5/4) sandy loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; few fine pores; strongly acid; gradual wavy boundary.

IIIC1—44 to 60 inches; yellowish brown (10YR 5/6) stratified loamy sand and fine sand; many coarse distinct grayish brown (10YR 5/2) mottles; single grain; loose; neutral; gradual wavy boundary.

IIIC2—60 to 70 inches; light yellowish brown (10YR 6/4) stratified silt loam and fine sand; many medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick. Loess thickness is less than 25 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4.

It is silt loam or silty clay loam and is strongly acid to neutral. The IIB2t horizon has similar colors and is clay loam, sandy clay loam, or loam. It ranges from strongly acid to neutral. The IIIC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. It is stratified loamy sand, sand, fine sand, and silt loam. The IIIC horizon is neutral to moderately alkaline and commonly contains carbonates.

Xenia series

The Xenia series consists of deep, moderately well drained soils on till plains. Permeability is moderately slow. These soils formed in loess and the underlying glacial till. Slope ranges from 0 to 6 percent.

Xenia soils are similar to Fincastle and Russell soils and are commonly near Cyclone, Miami, and Ragsdale soils. Fincastle soils have mottles below the surface layer. Russell and Miami soils have a brown, mottle-free subsoil and are on side slopes. Cyclone and Ragsdale soils have a mollic surface layer, a grayer subsoil, and are in depressions.

Typical pedon of Xenia silt loam, 2 to 6 percent slopes, in a cultivated field, 1,350 feet west and 1,000 feet north of the southeast corner of sec. 23, T. 22 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

B1t—8 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; thin discontinuous pale brown (10YR 6/3) silt coatings; common fine pores; many fine roots; slightly acid; clear smooth boundary.

B21t—13 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; common fine roots; common fine pores; few iron and manganese oxide concretions; strongly acid; clear wavy boundary.

IIB22t—24 to 37 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/2) clay films on faces of peds; few fine roots; 5 percent fine gravel; slightly acid; gradual smooth boundary.

IIB3t—37 to 43 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few thin patchy dark brown (7.5YR 4/2) clay films on faces of peds; 5 percent fine gravel; neutral; clear smooth boundary.

IIC—43 to 60 inches; brown (10YR 5/3) loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 36 to 65 inches thick. Loess thickness ranges from 22 to 40 inches.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles with chroma of 2 or less are within the upper 10 inches of the argillic horizon. The IIB2t and IIB3 horizons are clay loam or loam.

The B2t and IIB2t horizons are strongly acid to slightly acid, and the IIB3 horizon is medium acid to neutral. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

formation of the soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in the county are discussed.

factors of soil formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic processes. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate in which the soil material accumulated and has existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or topography of the land; and (5) the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks, and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil profile. Some time is always required for differentiation of soil horizons. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soil.

Glaciers covered the county as recently as about 20,000 years ago. The parent material of the soils of Clinton County was deposited by glaciers, by melt water from the glaciers, and by wind which blew silt or loess over the county. After this material was deposited, some of it was reworked and redeposited by subsequent actions of wind and water. Although parent materials are of similar glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited.

The soils in Clinton County formed mainly from Wisconsin age glacial till, glacial outwash, and loess. A thin layer of outwash was deposited over the till in some areas, and many of the soils on the till plain have outwash influence in the lower part of the solum. This outwash layer is not consistent either in depth or continuity. The influence of the outwash on soil development varies within short distances.

Some of the soils on the till plain have lacustrine influence in the solum. There are small areas on the till plain and in glacial sluiceways where the soils have developed entirely in lacustrine material. Soils along streams developed in recent alluvium. A layer of silty loess covers most of the county. The loess is as much as 50 inches thick in the southwestern corner and becomes thinner to the north and east.

In Clinton County, the bedrock beneath the unconsolidated deposits consists of limestone and shale. In the southwestern part of the county the bedrock is Devonian age shale. In a strip from Rossville to Sircleville, it is Devonian age shale and limestone. The soils of the rest of the county are underlain by Silurian age limestone.

Several glaciers have covered the county, but the Wisconsin glacier, the most recent, most influenced present soil development. Thickness of the glacial drift ranges from 100 to 400 feet. The shallow areas are in the Colfax and Geetingsville areas. The drift is thickest in the southern part of the county along lines which correspond to the Old Teays River System, a preglacial system which ran in a general east-west direction across central Indiana (*6*).

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. The small pebbles in glacial till have some sharp corners, indicating that they have not been rounded by water washing. The pebbles include a wide variety of rocks ranging from such sedimentary rocks as black shale to such igneous rocks as granite. The glacial till in Clinton County is mostly calcareous. The texture of the till is mainly loam, but in some areas it is sandy loam or clay loam. Layers of sand, loamy sand, and gravel are common. Generally the till is firm and compact because of consolidation by the glacial ice that covered it. An example of soils that formed in glacial till are those of the Hennepin series.

These soils are typically medium textured or moderately fine textured in the subsoil.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash material varies according to the speed of the stream of water that carried them. When the water slowed down, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, are carried along in the stream by slowly moving water.

Outwash in Clinton County is mainly along Wildcat Creek and other larger streams. The Ockley soils formed in outwash deposits.

A few outwash areas are scattered throughout the county in upland positions. These areas consist of small kames and eskers. The largest such area in the county is between Geetingsville and Sedalia. It is characterized by a series of ridges 1/4- to 1/2-mile long and rising from 25 to 50 feet above the general level of the land in the vicinity.

Soil parent material in the rolling end moraines ranges from loam till to loose sand and gravel. Small end moraines are located throughout the county except in the east-central and southeastern parts. In general, the till in these end moraines is not quite as firm as ground moraine till and contains more sand. Two soils that formed in thin loess and glacial till are the Miami soils, mainly on end moraines, and the Crosby soils, mostly on ground moraines. Some of the morainal ridges are a source of sand and gravel, although these layers are thin and usually contain considerable fines. A few abandoned gravel pits are scattered throughout these areas.

Lacustrine material was deposited from still or ponded glacial melt water. The coarser fragments drop out of moving water as outwash, and only such finer particles as very fine sand, silt, and clay remain to settle out in still water. Lacustrine deposits in Clinton County are dominantly silty or clayey but contain thin sand lenses. Lacustrine deposits in the county are mostly in potholes in the till plain.

Alluvial material was deposited by floodwaters of streams in recent time. This material varies in texture depending on the speed of the water by which it was deposited. Genesee and Landes soils formed in alluvium.

Organic deposits consist of partially decomposed plant remains. After the glaciers withdrew from the area, water was left standing in lakes and in depressions on outwash plains and till plains. Grasses and sedges growing in these shallow lakes died, and their remains fell to the bottom. Because of the wetness of these areas, the plant remains did not decompose. Later, white cedar and other water-tolerant trees grew on the areas. As these trees died, their residue became part of the organic accumulation. The lakes eventually filled with organic material and developed into muck.

The plant remains subsequently decomposed. In some areas, the material has changed little since deposition. The Houghton soils formed in organic material.

Loess is fine grained material consisting dominantly of silt-size particles. The loess in Clinton County was carried by wind from western sources, possibly the Wabash River Valley, and from local streams. The thickest deposits of loess are in the southwestern part of the county near Colfax and are about 3 to 4 feet deep on upland sites. Reesville soils formed entirely in loess, and Fincastle soils formed in 24 to 40 inches of loess over glacial till. Some loess was transported by water after it was originally deposited, resulting in silty deposits as much as 8 feet thick in depressions. These deposits may contain thin sandy layers.

plant and animal life

Plants have been the principal organisms influencing the soils in the county; however, bacteria, fungi, earthworms, animals, and the activities of man have also been important.

The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil. The remains of these plants accumulate on the surface and in the soil, decay, and eventually become organic matter. Plant roots provide channels for downward movement of water through the soil and add organic matter and nutrients that can be used by growing plants.

Most of this county was originally very heavily forested except the prairie area in the south-central and southwestern parts of the county. On such well drained soils as Miami and Russell soils, sugar maple, walnut, poplar, hickory, beech, and several kinds of oak were the predominant varieties of trees. Elm, ash, gum, and white oak were common on the poorly drained soils. A few wet soils also had sphagnum and other mosses which contributed substantially to the accumulation of organic matter. The Ragsdale and Milford soils developed under wet conditions.

In the prairie were many island-like groves of white oak and post oak on slightly elevated knolls and numerous patches of small timber on higher ground. The wide flats and all the depressed areas were either marshes or ponds during the greater part of each year. Drummer and Raub soils developed under prairie vegetation.

climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil. It also determines the amount of water available for weathering minerals and transporting soil material. Climate, through its influence on temperatures in the soil, determines the rate of chemical reactions that occur in the soil. These influences are important, but climatic effects on soils are evident in large areas rather than such relatively small areas as a county. The climate in Clinton County is midcontinental. The temperature varies widely from summer to winter. This presumably is similar to the climate that existed when the soils were being formed. Climate is uniform throughout the county.

relief

Relief, or topography, has a marked influence on the soils through its influence on natural drainage, erosion, plant cover, and soil temperature. In Clinton County, slopes range from 0 to 50 percent. Natural soil drainage ranges from well drained on the ridgetops to very poorly drained in the depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage, through its effect on aeration of the soil, determines the soil color. Runoff is greatest on the steeper slopes. In many low areas, water is temporarily ponded. Water and air move freely through most soils that are well drained and slowly through most soils that are very poorly drained. Iron compounds give most soils their color, and are brightly colored and oxidized in well drained soils. In poorly aerated soils, the soil color is dull gray and mottled because iron compounds are in a reduced state. The Ockley series is an example of a well drained, well aerated soil, and the Milford series is an example of a poorly aerated, very poorly drained soil.

time

A long time is required by the agents of soil formation to form distinct soil horizons from parent material. The differences in length of time that the parent material has been in place are commonly reflected in the degree of development of the soil profile. Some soils develop rapidly; others develop slowly.

The soils in Clinton County range from young to mature. The glacial deposits from which many of the soils formed have been exposed to soil-forming factors for a long enough time to allow distinct horizons to develop within the soil profile. However, some soils that formed in recent alluvial sediment have not been in place long enough for distinct horizons to develop.

The Genesee series is an example of a young soil formed in alluvial material. The Russell series shows the effect of time on leaching of lime from the soil. The parent material from which it developed was calcareous. It is now leached to a depth of 40 to 70 inches.

The Patton series was submerged under glacial lake water and protected from leaching much of the time. The Patton soils are leached to a depth of 20 to 40 inches, but a few profiles are leached to a depth as shallow as 12 inches. In contrast, the Starks series was above water and subject to leaching. The Starks series is leached to a depth of more than 40 inches.

processes of soil formation

Several processes have been involved in the formation of the soils of this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils of the county. The organic matter content of some soils is low, but that of the others is high. Generally, the soils that have the most organic matter, such as soils of the Treaty or Mahalasville series, have a thick, black surface horizon.

Carbonates and bases have been leached from the upper horizons of nearly all the soils of the county. Leaching is generally believed to precede the translocation of silicate clay minerals. Most all of the carbonates and bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, leaching is indicated by the absence of carbonates and by an acid reaction.

Clay accumulates in pores and other voids and forms films along which water moves. The leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation in the soils of this county. Soils of the Miami series are examples of soils in which translocated silicate clays have accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, or gleying, has occurred in all of the very poorly drained and somewhat poorly drained soils of this county. In the naturally wet soils, this process has been significant in horizon differentiation. The gray color of the subsoil indicates the reduction of iron oxides. The reduction is commonly accompanied by some transfer and redistribution of the iron from upper horizons to lower horizons or completely out of the profile. Mottles, which are in some horizons, indicate segregation of iron.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface layer throughout the year. This includes no-tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are

active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-75 at Frankfort, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	33.9	16.6	25.3	61	-14	9	2.03	.93	2.91	5	5.5
February---	37.6	19.7	28.7	63	-11	13	2.09	1.13	2.86	5	6.7
March------	47.2	27.8	37.5	77	3	112	2.78	1.52	3.81	7	4.1
April------	61.3	39.3	50.3	83	20	316	4.03	2.28	5.45	9	.5
May--------	72.1	49.5	60.8	91	29	645	4.19	2.82	5.44	8	.0
June-------	81.7	58.8	70.3	96	41	909	4.28	2.28	5.91	7	.0
July-------	84.7	62.1	73.4	97	46	1,035	4.56	2.58	6.17	7	.0
August-----	83.0	59.7	71.4	94	43	973	3.38	1.67	4.78	5	.0
September--	76.7	52.6	64.7	93	33	741	3.22	1.22	4.82	5	.0
October----	66.1	41.9	54.0	86	22	441	2.69	1.26	3.85	5	.0
November---	49.6	31.2	40.5	75	10	101	2.91	1.75	3.94	6	1.9
December---	37.8	21.8	29.8	65	-10	39	2.80	1.07	4.18	7	6.3
Year-----	61.0	40.1	50.6	98	-15	5,334	38.96	34.38	43.40	76	25.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-75 at Frankfort, Indiana]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 21	May 1	May 17
2 years in 10 later than--	April 17	April 26	May 11
5 years in 10 later than--	April 8	April 16	April 30
First freezing temperature in fall:			
1 year in 10 earlier than--	October 16	October 6	September 24
2 years in 10 earlier than--	October 21	October 10	September 29
5 years in 10 earlier than--	October 30	October 19	October 9

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-75 at Frankfort, Indiana]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	184	166	139
8 years in 10	190	173	146
5 years in 10	203	185	161
2 years in 10	216	198	176
1 year in 10	223	205	183

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area (Pct)	Cultivated crops	Specialty crops	Woodland	Urban uses	Intensive recreation areas
Drummer-Raub	9	Good	Fair: wetness.	Fair: wetness.	Poor: wetness.	Poor: wetness.
Ragsdale-Fincastle	10	Good	Fair: wetness.	Fair: wetness.	Poor: wetness.	Poor: wetness.
Cyclone-Fincastle-Crosby	29	Good	Fair: wetness.	Fair: wetness.	Poor: wetness.	Poor: wetness.
Sable-Drummer	5	Good	Fair: wetness.	Fair: wetness.	Poor: wetness.	Poor: wetness.
Miami-Crosby-Fincastle	42	Fair: erosion.	Fair: erosion.	Good	Fair: wetness.	Fair: wetness, slope.
Ceresco-Ockley	5	Fair: flooding.	Fair: flooding.	Good	Fair: flooding.	Fair: flooding.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Be	Brenton silt loam	433	0.2
CbA	Camden Variant silt loam, 0 to 2 percent slopes	3,118	1.2
Ce	Ceresco loam	7,050	2.7
Cy	Cyclone silt loam	30,435	11.7
DaA	Dana silt loam, 0 to 2 percent slopes	1,039	0.4
DaB	Dana silt loam, 2 to 6 percent slopes	458	0.2
Dr	Drummer silty clay loam	10,547	4.0
FcA	Fincastle silt loam, 0 to 2 percent slopes	13,102	5.0
FdA	Fincastle-Crosby silt loams, 0 to 3 percent slopes	63,266	24.3
FsB	Fox silt loam, 2 to 6 percent slopes	480	0.2
FsC	Fox loam, 6 to 15 percent slopes	330	0.1
Gn	Genesee silt loam, sandy substratum	1,245	0.5
HeF	Hennepin silt loam, 18 to 50 percent slopes	1,647	0.6
Ho	Houghton muck, undrained	247	0.1
La	Landes fine sandy loam	764	0.3
Ma	Mahalasville silty clay loam	6,335	2.4
McA	Martinsville silt loam, 0 to 2 percent slopes	814	0.3
McB2	Martinsville silt loam, 2 to 6 percent slopes, eroded	890	0.3
MnC	Miami silt loam, 6 to 12 percent slopes	1,630	0.6
MnD	Miami silt loam, 12 to 18 percent slopes	227	0.1
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	3,126	1.2
MsD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	623	0.2
MtB	Miami-Crosby silt loams, 2 to 6 percent slopes	40,889	15.7
MwA	Miami-Martinsville silt loams, 0 to 2 percent slopes	492	0.2
Mx	Milford silty clay loam	2,453	0.9
OcA	Ockley silt loam, 0 to 2 percent slopes	1,942	0.7
OcB	Ockley silt loam, 2 to 6 percent slopes	647	0.2
Pc	Palms muck, undrained	194	0.1
PgB	Parr silt loam, 1 to 5 percent slopes	689	0.3
Pn	Patton silty clay loam	4,228	1.6
Pr	Pits, gravel	130	*
PtA	Proctor silt loam, 0 to 3 percent slopes	472	0.2
Ra	Ragsdale silt loam	12,424	4.8
RdA	Raub silt loam, 0 to 2 percent slopes	8,025	3.1
Re	Reesville silt loam	1,270	0.5
RuB	Russell silt loam, 2 to 6 percent slopes	1,130	0.4
Sa	Sable silty clay loam	321	0.1
Sc	Sable-Drummer silty clay loams	9,364	3.6
Sd	Saranac silty clay loam	234	0.1
St	Sleeth silt loam	496	0.2
Su	Sloan silt loam	1,372	0.5
Sx	Starks silt loam	6,595	2.5
Ty	Treaty silt loam	14,489	5.6
Ud	Udorthents, loamy	367	0.1
Wa	Wallkill silt loam	353	0.1
We	Westland silty clay loam	773	0.3
Wh	Whitaker silt loam	1,870	0.7
XeA	Xenia silt loam, 0 to 2 percent slopes	1,071	0.4
XeB	Xenia silt loam, 2 to 6 percent slopes	384	0.1
	Total	260,480	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Tons	AUM*
Be----------------------- Brenton	139	43	54	4.6	9.2
CbA---------------------- Camden Variant	120	40	46	4.0	8.0
Ce----------------------- Ceresco	90	35	35	4.0	8.0
Cy----------------------- Cyclone	155	54	55	5.1	10.2
DaA---------------------- Dana	130	46	52	4.3	8.6
DaB---------------------- Dana	125	40	52	4.3	8.6
Dr----------------------- Drummer	155	54	55	5.1	10.2
FcA---------------------- Fincastle	130	40	52	4.3	8.6
FdA---------------------- Fincastle-Crosby	125	40	50	4.0	8.0
FsB---------------------- Fox	85	30	42	4.5	9.0
FsC---------------------- Fox	70	22	38	4.0	8.0
Gn----------------------- Genesee	95	35	---	4.0	8.0
HeF---------------------- Hennepin	---	---	---	2.1	4.2
Ho----------------------- Houghton	---	---	---	---	---
La----------------------- Landes	90	32	43	3.5	7.0
Ma----------------------- Mahalasville	155	54	55	5.1	10.2
McA---------------------- Martinsville	120	42	48	4.0	8.0
McB2--------------------- Martinsville	115	35	46	3.8	7.6
MnC---------------------- Miami	95	33	43	3.1	6.2
MnD---------------------- Miami	75	25	36	2.6	5.2
MsC3--------------------- Miami	75	25	35	3.0	6.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Tons	AUM*
MsD3----------------------- Miami	---	---	---	2.5	5.0
MtB----------------------- Miami-Crosby	109	30	50	3.6	7.1
MwA----------------------- Miami-Martinsville	114	40	50	3.7	7.5
Mx----------------------- Milford	130	40	50	4.6	9.2
OcA----------------------- Ockley	110	35	44	3.6	7.2
OcB----------------------- Ockley	105	30	44	3.6	7.2
Pc----------------------- Palms	---	---	---	---	---
PgB----------------------- Parr	120	42	54	4.0	8.0
Pn----------------------- Patton	155	48	56	5.1	10.2
Pr**. Pits					
PtA----------------------- Proctor	125	40	51	5.0	10.0
Ra----------------------- Ragsdale	155	54	55	5.1	10.2
RdA----------------------- Raub	140	49	56	4.6	9.2
Re----------------------- Reesville	130	40	40	4.5	9.0
RuB----------------------- Russell	120	38	48	4.0	8.0
Sa----------------------- Sable	155	54	55	5.1	10.2
Sc----------------------- Sable-Drummer	155	54	55	5.1	10.2
Sd----------------------- Saranac	125	44	50	4.5	9.0
St----------------------- Sleeth	120	42	48	4.0	8.0
Su----------------------- Sloan	95	42	45	4.6	9.2
Sx----------------------- Starks	130	40	48	4.6	9.2
Ty----------------------- Treaty	150	52	55	4.8	9.6
Ud**. Udorthents					

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Tons	AUM*
Wa----------------------- Wallkill	100	30	---	3.5	7.0
We----------------------- Westland	140	45	45	4.6	9.2
Wh----------------------- Whitaker	130	46	52	4.3	8.6
XeA---------------------- Xenia	120	40	48	4.0	8.0
XeB---------------------- Xenia	112	35	48	4.0	8.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	9,381	---	---	---	---
II	232,805	45,567	187,238	---	---
III	11,733	1,960	9,009	---	---
IV	3,353	3,353	---	---	---
V	441	---	441	---	---
VI	623	623	---	---	---
VII	1,647	1,647	---	---	---
VIII	367	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Be: Brenton	---	---------	---------	---------	---------		---	Eastern cottonwood, American sycamore, yellow-poplar, white oak, northern red oak, green ash, sugar maple.
CbA: Camden Variant	1o	Slight	Slight	Slight	Slight	Yellow-poplar White oak Northern red oak Sweetgum Green ash	98 85 85 --- ---	Eastern white pine, yellow-poplar, white oak, black walnut, green ash, white ash.
Ce: Ceresco	2o	Slight	Slight	Slight	Slight	Northern red oak White ash Red maple Silver maple Eastern cottonwood	78 --- --- --- ---	Eastern white pine, eastern cottonwood, white ash.
Cy: Cyclone	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	90 75 90	Eastern white pine, red maple, white ash, sweetgum.
DaA, DaB: Dana	---	---------	---------	---------	---------		---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
Dr: Drummer	---	---------	---------	---------	---------		---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak, sweetgum.
FcA: Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak White oak Pin oak Yellow-poplar Sweetgum	75 70 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
FdA*:								
Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak White oak Pin oak Yellow-poplar Sweetgum	75 70 85 85 80	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Crosby	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum Northern red oak	70 85 85 80 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore, white oak.
FsB, FsC: Fox	2o	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple	80 --- ---	Yellow-poplar, white ash, eastern white pine, red pine, black locust, white oak.
Gn: Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.
HeF: Hennepin	1r	Moderate	Moderate	Slight	Slight	Northern red oak White oak	85 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ho------------------ Houghton	4w	Slight	Severe	Severe	Severe	White ash-----------	51	
						Red maple-----------	51	
						Quaking aspen-------	56	
						Black willow--------	---	
						Silver maple--------	76	
La------------------ Landes	1o	Slight	Slight	Slight	Slight	Eastern cottonwood--	105	Sugar maple, eastern cottonwood, yellow-poplar, American sycamore, sweetgum, green ash, black walnut, eastern white pine.
						Yellow-poplar-------	95	
						American sycamore---	---	
						Sweetgum------------	---	
						Green ash-----------	---	
Ma------------------ Mahalasville	2w	Slight	Severe	Severe	Severe	Pin oak-------------	86	Eastern white pine, red maple, white ash, sweetgum.
						White oak-----------	75	
						Sweetgum------------	90	
MeA, MeB2----------- Martinsville	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
MnC, MnD, MsC3, MsD3--------------- Miami	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
MtB*:								
Miami--------------	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
Crosby-------------	3o	Slight	Slight	Slight	Slight	White oak-----------	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	
						Yellow-poplar-------	85	
						Sweetgum------------	80	
						Northern red oak----	75	
MwA*:								
Miami--------------	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
Martinsville-------	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
						Sweetgum------------	76	
Mx------------------ Milford	2w	Slight	Severe	Severe	Severe		---	Pin oak, green ash, red maple.
OcA, OcB------------ Ockley	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Northern red oak----	90	
						Yellow-poplar-------	98	
						Sweetgum------------	76	
Pc------------------ Palms	4w	Slight	Severe	Severe	Severe	White ash-----------	51	
						Red maple-----------	51	
						Quaking aspen-------	56	
						Black willow--------	---	
						Silver maple--------	76	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
PgB: Parr	---	---	---	---	---		---	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Pn: Patton	2w	Slight	Severe	Moderate	Moderate	Pin oak White oak Sweetgum Northern red oak	88 75 80 75	Eastern white pine, Norway spruce, red maple, white ash, sweetgum.
PtA: Proctor	---	---	---	---	---		---	Black walnut, green ash, red maple, eastern white pine, red pine.
Ra: Ragsdale	2w	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	90 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
RdA: Raub	---	---	---	---	---		---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Re: Reesville	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	75 85 90	Eastern white pine, white ash, red maple.
RuB: Russell	1o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Sa: Sable	---	---	---	---	---		---	Pin oak, green ash, European larch, eastern cottonwood.
So*:								
Sable	---	---	---	---	---		---	Pin oak, green ash, eastern cottonwood.
Drummer	---	---	---	---	---		---	Eastern cottonwood, American sycamore, red maple, green ash, pin oak, sweetgum.
Sd: Saranac	2w	Slight	Severe	Severe	Severe	Pin oak Red maple Bur oak White ash Sweetgum	85 --- --- --- ---	Eastern white pine, red maple, white ash, sweetgum.
St: Sleeth	3o	Slight	Slight	Slight	Slight	Pin oak Yellow-poplar Sweetgum White oak	85 85 80 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Su: Sloan	2w	Slight	Severe	Severe	Severe	Pin oak Swamp white oak Red maple	86 --- ---	Red maple, white ash, white ash.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
Sx------------------ Starks	2o	Slight	Slight	Slight	Slight	White oak-----------	80	Black walnut, American sycamore, yellow-poplar, white oak, green ash, sugar maple.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
Ty------------------ Treaty	2w	Slight	Severe	Severe	Severe	Pin oak-------------	90	Eastern white pine, red maple, white ash, sweetgum.
						White oak-----------	75	
						Sweetgum------------	90	
						Northern red oak----	---	
Wa------------------ Wallkill	4w	Slight	Severe	Severe	Severe	Pin oak-------------	70	
						Red maple-----------	65	
We------------------ Westland	2w	Slight	Severe	Severe	Severe	Pin oak-------------	85	Eastern white pine, red maple, white ash, sweetgum.
						Sweetgum------------	90	
						White oak-----------	75	
Wh------------------ Whitaker	3o	Slight	Slight	Slight	Slight	White oak-----------	70	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	
						Yellow-poplar-------	85	
						Sweetgum------------	80	
						Northern red oak----	75	
XeA, XeB------------ Xenia	1o	Slight	Slight	Slight	Slight	White oak-----------	90	Eastern white pine, red pine, black walnut, black locust, yellow-poplar, white ash.
						Yellow-poplar-------	98	
						Sweetgum------------	76	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Be: Brenton	Redosier dogwood, gray dogwood.	Silky dogwood, Amur honeysuckle, autumn-olive.	Eastern redcedar, Russian-olive.	Norway spruce, eastern white pine, Douglas-fir.	American sycamore, eastern cottonwood.
CbA: Camden Variant	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
Ce: Ceresco	---	White spruce, whitebelle honeysuckle, silky dogwood.	Eastern white pine, northern white-cedar, tall purple willow, Siberian crabapple.	---	Carolina poplar.
Cy: Cyclone	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
DaA, DaB: Dana	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
Dr: Drummer	Redosier dogwood, gray dogwood.	Silky dogwood, Amur maple, oriental arborvitae.	Baldcypress, Russian-olive.	Norway spruce, green ash.	American sycamore, pin oak, eastern cottonwood.
FcA: Fincastle	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
FdA*: Fincastle	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
FdA*:					
Crosby	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
FsB, FsC Fox	---	Autumn-olive, Amur honeysuckle, blackhaw, shadblow serviceberry, American cranberrybush, cornelian cherry dogwood.	---	Norway spruce, white spruce, American basswood.	Eastern white pine.
Gn Genesee	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
HeF. Hennepin					
Ho Houghton	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
La Landes	Redosier dogwood, gray dogwood.	Silky dogwood, autumn-olive.	Amur maple, baldcypress, Russian-olive, eastern cottonwood.	Eastern white pine, Norway spruce.	Red maple, American sycamore.
Ma Mahalasville	Gray dogwood, dwarf purple willow.	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, medium purple willow, tall purple willow.	---	Lombardy poplar.
McA, McB2 Martinsville	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
MnC, MnD, MsC3, MsD3: Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce	Eastern white pine, honeylocust.
MtB*: Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce	Eastern white pine, honeylocust.
Crosby	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
MwA*: Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce	Eastern white pine, honeylocust.
Martinsville	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
Mx: Milford	Redosier dogwood, gray dogwood.	Oriental arborvitae, Amur maple, silky dogwood.	Russian-olive, baldcypress.	Green ash, Norway spruce.	Eastern cottonwood, pin oak, American sycamore.
OcA, OcB: Ockley	---	Autumn-olive, American cranberrybush, late lilac, Tatarian honeysuckle.	White spruce	Eastern white pine, Norway spruce.	Carolina poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pc: Palms	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
PgB: Parr	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
Pn: Patton	Gray dogwood, redosier dogwood.	Amur maple, silky dogwood, oriental arborvitae.	Russian-olive, baldcypress.	Green ash, Norway spruce.	Eastern cottonwood, American sycamore, pin oak.
Pr*. Pits					
PtA: Proctor	Redosier dogwood, gray dogwood.	Autumn-olive, silky dogwood, Amur honeysuckle.	Russian-olive, eastern redcedar.	Douglas-fir, Norway spruce, eastern white pine.	American sycamore, eastern cottonwood.
Ra: Ragsdale	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
RdA: Raub	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
Re: Reesville	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	---	American basswood, Norway spruce, white spruce.	Eastern white pine.
RuB: Russell	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Sa------------------ Sable	Redosier dogwood, gray dogwood.	Silky dogwood, oriental arborvitae, Amur maple.	Baldcypress, Russian-olive.	Norway spruce, green ash.	American sycamore, eastern cottonwood, pin oak.
Sc*:					
Sable-------------	Gray dogwood-------	Silky dogwood, American cranberrybush, redosier dogwood.	Green ash, northern white-cedar.	Pin oak, European larch.	---
Drummer-----------	Redosier dogwood, gray dogwood.	Silky dogwood, Amur maple, oriental arborvitae.	Baldcypress, Russian-olive.	Norway spruce, green ash.	American sycamore, pin oak, eastern cottonwood.
Sd------------------ Saranac	Silky dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
St------------------ Sleeth	Cutleaf staghorn sumac.	Blackhaw, arrowwood, cornelian cherry dogwood, rose-of-sharon, Amur honeysuckle, American cranberrybush, autumn-olive.	White spruce-------	American basswood, Norway spruce.	Eastern white pine.
Su------------------ Sloan	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Sx------------------ Starks	Redosier dogwood, arrowwood, gray dogwood.	Silky dogwood, autumn-olive.	Flowering dogwood, eastern redcedar, Amur maple.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood.
Ty------------------ Treaty	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
Ud*. Udorthents					
Wa------------------ Wallkill	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.
We------------------ Westland	Gray dogwood, dwarf purple willow.	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	Lombardy poplar.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
Wh: Whitaker	---	Autumn-olive, Amur honeysuckle, American cranberrybush, blackhaw, shadblow serviceberry, arrowwood, cornelian cherry dogwood, rose-of-sharon.	---	Norway spruce, white spruce, American basswood.	Eastern white pine.
XeA, XeB: Xenia	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Be: Brenton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CbA: Camden Variant	Slight	Slight	Slight	Slight	Slight.
Ce: Ceresco	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty, floods.
Cy: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
DaA: Dana	Slight	Slight	Slight	Slight	Slight.
DaB: Dana	Slight	Slight	Moderate: slope.	Slight	Slight.
Dr: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FcA: Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FdA*:					
Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FsB: Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
FsC: Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Gn: Genesee	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
La: Landes	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Ma: Mahalasville	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
McA: Martinsville	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
McB2 Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
MnC Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
MnD Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MsC3 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
MsD3 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MtB*:					
Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
MwA*:					
Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Martinsville	Slight	Slight	Slight	Slight	Slight.
Mx Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
OcA Ockley	Slight	Slight	Slight	Slight	Slight.
OcB Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
Pc Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
PgB Parr	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Pn Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pr*. Pits					
PtA Proctor	Slight	Slight	Slight	Slight	Slight.
Ra Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RdA Raub	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Re: Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RuB: Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
Sa: Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
So*:					
Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sd: Saranac	Severe: floods, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
St: Sleeth	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Su: Sloan	Severe: ponding, floods.	Severe: ponding.	Severe: ponding, floods.	Severe: ponding.	Severe: ponding, floods.
Sx: Starks	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ty: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ud*. Udorthents					
Wa: Wallkill	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
We: Westland	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wh: Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
XeA: Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
XeB: Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Be: Brenton	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CbA: Camden Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Ce: Ceresco	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cy: Cyclone	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
DaA, DaB: Dana	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Dr: Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
FcA: Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FdA*:										
Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FsB, FsC: Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gn: Genesee	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HeF: Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Ho: Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
La: Landes	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ma: Mahalasville	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
McA, McB2: Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC: Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MnD: Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MsC3: Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MsD3: Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MtB*:										
Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MtB*:										
Crosby	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MwA*:										
Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mx Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
OcA, OcB Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pc Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Poor.
PgB Parr	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pn Patton	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Pr*. Pits										
PtA Proctor	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ra Ragsdale	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
RdA Raub	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Re Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RuB Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sa Sable	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Sc*:										
Sable	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Drummer	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
Sd Saranac	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
St Sleeth	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Su Sloan	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Sx Starks	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ty Treaty	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ud*. Udorthents										
Wa----------------- Wallkill	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
We----------------- Westland	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wh----------------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
XeA, XeB----------- Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Be: Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
CbA: Camden Variant	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Ce: Ceresco	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Moderate: wetness, droughty, floods.
Cy: Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
DaA: Dana	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
DaB: Dana	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Dr: Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength, frost action.	Severe: ponding.
FcA: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FdA*:						
Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FsB: Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
FsC: Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Gn: Genesee	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
HeF: Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Ho: Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: excess humus, ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
La----------------- Landes	Severe: cutbanks cave, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ma----------------- Manalasville	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
McA---------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
McB2--------------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
MnC---------------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MnD---------------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MsC3--------------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MsD3--------------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MtB*:						
Miami--------------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
Crosby------------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
MwA*:						
Miami--------------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, low strength.	Slight.
Martinsville------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
Mx----------------- Milford	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding.	Severe: ponding.
OcA---------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
OcB---------------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Pc----------------- Palms	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.
PgB---------------- Parr	Slight----------	Moderate: shrink-swell.	Slight----------	Moderate: shrink-swell.	Severe: low strength.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Pn----------------- Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action, low strength.	Severe: ponding.
Pr*. Pits						
PtA---------------- Proctor	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
Ra----------------- Ragsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
RdA---------------- Raub	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength. frost action.	Moderate: wetness.
Re----------------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
RuB---------------- Russell	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Sa----------------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength, frost action.	Severe: ponding.
Sc*: Sable-------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, frost action, ponding.	Severe: ponding.
Drummer-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength, frost action.	Severe: ponding.
Sd----------------- Saranac	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: low strength, floods, ponding.	Severe: ponding.
St----------------- Sleeth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Su----------------- Sloan	Severe: ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding, low strength.	Severe: floods, ponding.
Sx----------------- Starks	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Moderate: wetness.
Ty----------------- Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.
Ud*. Udorthents						

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Wa: Wallkill	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding.
We: Westland	Severe: ponding, cutbanks cave.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding.	Severe: ponding.
Wh: Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
XeA: Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
XeB: Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Be----------------- Brenton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CbA---------------- Camden Variant	Slight-----------	Moderate: seepage.	Slight-----------	Slight-----------	Good.
Ce----------------- Ceresco	Severe: floods, wetness.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: wetness.
Cy----------------- Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
DaA, DaB----------- Dana	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight-----------	Fair: too clayey, wetness.
Dr----------------- Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
FcA---------------- Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
FdA*:					
Fincastle----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Crosby-------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FsB---------------- Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FsC---------------- Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Gn----------------- Genesee	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods.	Fair: thin layer.
HeF---------------- Hennepin	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ho----------------- Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
La----------------- Landes	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ma: Manalasville	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: hard to pack, ponding.
McA: Martinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
McB2: Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
MnC: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MnD: Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MsC3: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MsD3: Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MtB*:					
Miami	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MwA*:					
Miami	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Martinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
Mx: Milford	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: ponding, too clayey.
OcA, OcB: Ockley	Slight	Severe: seepage.	Severe: seepage.	Slight	Poor: small stones.
Pc: Palms	Severe: ponding, subsides.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
PgB: Parr	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Pn: Patton	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pr*. Pits					

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PtA: Proctor	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ra: Ragsdale	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
RdA: Raub	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness, hard to pack.
Re: Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
RuB: Russell	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Sa: Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Sc*:					
Sable	Severe: ponding.	Severe: ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding.
Drummer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Sg: Saranac	Severe: percs slowly, ponding.	Severe: ponding, floods.	Severe: ponding, floods.	Severe: ponding, floods.	Poor: ponding, too clayey.
St: Sleeth	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Su: Sloan	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Severe: floods, ponding.	Poor: ponding.
Sx: Starks	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Ty: Treaty	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ud*. Udorthents					
Wa: Wallkill	Severe: ponding.	Severe: ponding, seepage.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding.
We: Westland	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding, seepage.	Poor: ponding.
Wh: Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
XeA, XeB: Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Be: Brenton	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
CbA: Camden Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Ce: Ceresco	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Cy: Cyclone	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
DaA, DaB: Dana	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Dr: Drummer	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FcA: Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FdA*:				
Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
FsB, FsC: Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
Gn: Genesee	Good	Probable	Improbable: too sandy.	Good.
HeF: Hennepin	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, area reclaim.
Ho: Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
La: Landes	Fair: low strength.	Probable	Improbable: too sandy.	Fair: thin layer.
Ma: Mahalasville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
McA, McB2: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MnC: Miami	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MnD: Miami	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MsC3 Miami	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MsD3 Miami	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MtB*:				
Miami	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
MwA*:				
Miami	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mx Milford	Poor: wetness, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
OcA, OcB Ockley	Good	Probable	Probable	Poor: small stones, area reclaim.
Pc Palms	Poor: wetness, low strength.	Improbable: excess humus, excess fines.	Improbable: excess humus, excess fines.	Poor: wetness, excess humus.
PgB Parr	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Pn Patton	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pr*. Pits				
PtA Proctor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Ra Ragsdale	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RdA Raub	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Re Reesville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
RuB Russell	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Sa Sable	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sc*:				
Sable	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Drummer	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sd Saranac	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
St Sleeth	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Su Sloan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sx Starks	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Ty Treaty	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ud*. Udorthents				
Wm Wallkill	Poor: low strength, frost action, excess humus.	Improbable: excess fines, excess humus.	Improbable: excess fines, excess humus.	Poor: wetness.
We Westland	Poor: wetness, low strength.	Probable	Probable	Poor: wetness.
Wh Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
XeA, XeB Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Be-----Brenton	Seepage-----	Wetness-----	Slow refill, deep to water.	Frost action---	Wetness-----	Wetness.
CbA-----Camden Variant	Seepage-----	Piping-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
Ce-----Ceresco	Seepage-----	Seepage, piping, wetness.	Cutbanks cave--	Floods, frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, droughty, rooting depth.
Cy-----Cyclone	Seepage-----	Ponding-----	Slow refill----	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
DaA-----Dana	Seepage-----	Thin layer-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
DaB-----Dana	Seepage, slope.	Thin layer-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
Dr-----Drummer	Seepage-----	Ponding-----	Slow refill----	Frost action, ponding.	Ponding-----	Wetness.
FcA-----Fincastle	Seepage-----	Wetness-----	Slow refill----	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
FdA*:						
Fincastle-----	Seepage-----	Wetness-----	Slow refill----	Frost action---	Erodes easily, wetness.	Wetness, erodes easily.
Crosby-----	Favorable-----	Piping, wetness.	Slow refill----	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
FsB-----Fox	Seepage-----	Seepage, piping.	No water-----	Deep to water--	Too sandy-----	Rooting depth.
FsC-----Fox	Seepage, slope.	Seepage, piping.	No water-----	Deep to water--	Slope, too sandy.	Slope, rooting depth.
Gn-----Genesee	Seepage-----	Piping-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
HeF-----Hennepin	Slope-----	Favorable-----	No water-----	Not needed-----	Slope, percs slowly.	Slope, percs slowly.
Ho-----Houghton	Seepage-----	Excess humus, ponding.	Slow refill----	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
La-----Landes	Seepage-----	Seepage, piping.	Deep to water--	Not needed-----	Soil blowing---	Favorable.
Ma-----Mahalasville	Seepage-----	Thin layer, ponding.	Slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
McA-----Martinsville	Seepage-----	Thin layer-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
McB2-----Martinsville	Seepage, slope.	Thin layer-----	No water-----	Deep to water--	Erodes easily--	Erodes easily.
MnC, MnD, MsC3, MsD3-----Miami	Slope-----	Piping-----	No water-----	Deep to water--	Slope, erodes easily.	Slope, erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
MtB*:						
Miami	Seepage, slope.	Piping	No water	Deep to water	Erodes easily	Erodes easily, rooting depth.
Crosby	Slope	Piping, wetness.	Slow refill	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
MwA*:						
Miami	Seepage	Piping	No water	Deep to water	Erodes easily	Erodes easily, rooting depth.
Martinsville	Seepage	Thin layer	No water	Deep to water	Erodes easily	Erodes easily.
Mx Milford	Favorable	Ponding	Slow refill	Ponding, frost action.	Ponding, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
OcA Ockley	Seepage	Thin layer	No water	Deep to water	Erodes easily	Erodes easily.
OcB Ockley	Seepage, slope.	Thin layer	No water	Deep to water	Erodes easily	Erodes easily.
Pc Palms	Seepage	Excess humus, ponding.	Slow refill	Ponding, frost action, subsides.	Ponding, soil blowing.	Wetness.
PgB Parr	Seepage, slope.	Piping	No water	Deep to water	Percs slowly	Percs slowly.
Pn Patton	Seepage	Ponding	Slow refill	Ponding	Ponding	Wetness.
Pr*. Pits						
PtA Proctor	Seepage	Wetness	Deep to water, slow refill.	Frost action	Erodes easily, wetness.	Erodes easily.
Ra Ragsdale	Favorable	Thin layer, ponding.	Slow refill	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
RdA Raub	Favorable	Wetness, hard to pack.	Slow refill	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
Re Reesville	Seepage	Wetness	Slow refill	Frost action	Wetness	Wetness, erodes easily.
RuB Russell	Seepage, slope.	Thin layer	No water	Deep to water	Erodes easily	Erodes easily.
Sa Sable	Seepage	Ponding	Slow refill	Frost action, ponding.	Ponding	Wetness.
Sc*:						
Sable	Seepage	Ponding, piping.	Slow refill	Ponding, frost action.	Ponding, erodes easily.	Wetness, erodes easily.
Drummer	Seepage	Ponding	Slow refill	Frost action, ponding.	Ponding	Wetness.
Sd Saranac	Favorable	Hard to pack, wetness.	Slow refill	Floods, frost action.	Not needed	Wetness.
St Sleeth	Seepage	Wetness	Cutbanks cave	Frost action	Wetness	Wetness.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Su: Sloan	Favorable	Piping, wetness.	Favorable	Ponding, floods.	Ponding, erodes easily.	Wetness.
Sx: Starks	Seepage	Wetness	Slow refill, deep to water.	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
Ty: Treaty	Seepage	Wetness	Slow refill	Ponding, frost action.	Ponding, erodes easily.	Wetnesa, erodes easily.
Ud*. Udorthents						
Wa: Wallkill	Seepage	Low strength, piping, excess humus.	Favorable	Floods, poor outlets, frost action.	Not needed	Wetness.
We: Westland	Seepage	Wetness	Slow refill	Percs slowly, floods, frost action.	Not needed	Wetness, percs slowly.
Wh: Whitaker	Seepage	Wetness	Slow refill, cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
XeA: Xenia	Seepage	Thin layer, wetness.	Slow refill	Frost action	Erodes easily, wetness.	Erodes easily.
XeB: Xenia	Seepage, slope.	Thin layer, wetness.	Slow refill	Frost action, slope.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Be-----------------Brenton	0-11	Silt loam--------	CL, ML	A-6, A-4	0	100	95-100	95-100	80-100	30-40	5-15
	11-40	Silty clay loam, loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	75-95	35-50	10-25
	40-60	Stratified silt loam to loamy sand.	CL-ML, CL, SM-SC, SC	A-4, A-6, A-2	0	95-100	85-100	80-100	30-85	20-35	5-20
CbA----------------Camden Variant	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-98	25-35	5-15
	12-32	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	95-100	90-100	90-100	60-98	35-45	15-25
	32-48	Sandy loam-------	SM, SM-SC	A-2, A-4	0	95-100	90-100	60-75	30-45	<25	NP-7
	48-65	Stratified loamy sand to loam.	SM	A-2, A-4, A-1	0-2	90-100	85-100	45-80	20-40	<30	NP-7
	65-80	Loam-------------	ML, CL-ML, CL	A-4, A-6	0-3	85-95	80-90	75-85	50-65	15-30	2-14
Ce-----------------Ceresco	0-14	Loam-------------	SM, ML, CL-ML, SM-SC	A-2, A-4	0	100	100	60-90	30-75	10-20	NP-6
	14-60	Sandy loam, loamy sand, loam.	SM, ML, CL, SC	A-2, A-4	0	95-100	80-100	60-95	15-80	15-30	NP-8
Cy-----------------Cyclone	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	14-49	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	49-60	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	60-70	Loam-------------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-75	20-30	6-15
DaA, DaB-----------Dana	0-10	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	30-35	8-12
	10-29	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-98	38-50	20-32
	29-40	Clay loam--------	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	37-50	17-30
	40-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
Dr-----------------Drummer	0-14	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	72-95	30-50	15-30
	14-39	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	95-100	85-100	70-90	30-50	15-30
	39-62	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	62-70	Loam-------------	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-80	20-35	7-20
FcA----------------Fincastle	0-13	Silt loam--------	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	13-32	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	32-59	Clay loam, loam	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	59-70	Loam-------------	CL, ML, CL-ML	A-4	0-3	88-96	82-90	70-86	50-66	20-30	3-10
FdA*: Fincastle----------	0-13	Silt loam--------	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	13-32	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	32-59	Clay loam, loam	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	59-70	Loam-------------	CL, ML, CL-ML	A-4	0-3	88-96	82-90	70-86	50-66	20-30	3-10
Crosby------------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-31	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	31-60	Loam-------------	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
FsB----------------- Fox	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	8-11	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	85-100	75-100	70-95	55-90	25-50	10-25
	11-35	Clay loam, gravelly clay loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	75-95	50-95	20-65	25-45	10-25
	35-60	Sand and gravel	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
FsC----------------- Fox	0-6	Loam-------------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	6-32	Clay loam, gravelly clay loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	85-100	75-95	50-95	20-65	25-45	10-25
	32-60	Sand and gravel	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Gn------------------ Genesee	0-9	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	9-40	Loam, silt loam	ML, CL	A-4, A-6	0	100	95-100	85-95	75-85	26-40	3-15
	40-49	Sandy loam, loam.	ML, CL-ML, CL	A-4, A-6	0	95-100	90-100	60-80	50-70	20-40	3-15
	49-60	Sand-------------	SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	45-70	5-20	---	NP
HeF----------------- Hennepin	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	4-11	Loam-------------	CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	70-100	50-95	20-50	5-25
	11-60	Loam-------------	CL, CL-ML,	A-4, A-6, A-7	0-5	85-100	80-100	70-100	50-95	20-50	5-25
Ho------------------ Houghton	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
La------------------ Landes	0-10	Fine sandy loam	SM, ML	A-4	0	100	95-100	85-95	35-55	25-40	NP-10
	10-60	Stratified fine sand to silt loam.	SM, ML, SP-SM, SC	A-2, A-4	0	100	95-100	60-95	10-70	<30	NP-10
Ma------------------ Mahalasville	0-16	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	16-35	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	35-44	Loam, clay loam	ML, CL-ML, CL	A-6, A-4	0	95-100	90-95	85-95	60-75	22-35	3-15
	44-60	Stratified silt to sand.	CL, SC, SP-SC, CL-ML	A-4, A-2-4	0	75-90	70-80	50-80	10-60	15-30	NP-10
McA, McB2----------- Martinsville	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	10-34	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	34-58	Sandy loam, sandy clay loam, loamy sand.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	58-75	Stratified sand to silt loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9

See footnote at end of table

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
MnC, MnD: Miami	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-36	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	36-60	Loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
MsC3, MsD3: Miami	0-6	Clay loam	CL	A-6, A-7	0	100	90-100	75-95	65-95	30-45	15-25
	6-28	Clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	28-60	Loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
MtB*: Miami	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-36	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	36-60	Loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Crosby	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-31	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	31-60	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
MwA*: Miami	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	8-36	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	36-60	Loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Martinsville	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	10-34	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	34-58	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	60-80	30-60	30-40	2-8
	58-60	Stratified sand to silt loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
Mx: Milford	0-17	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	17-38	Silty clay, silty clay loam, silt loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	38-60	Stratified silty clay loam to sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
OcA, OcB----------- Ockley	0-9	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	9-25	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	25-51	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	51-60	Stratified sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
Pc----------------- Palms	0-26	Sapric material	Pt	---	---	---	---	---	---	---	---
	26-60	Clay loam, silt loam, loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
PgB---------------- Parr	0-10	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	10-37	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
	37-60	Loam------------	CL, ML, CL-ML	A-4, A-6	0-3	85-95	80-90	75-85	50-65	17-30	2-14
Pn----------------- Patton	0-12	Silty clay loam	CL	A-6	0	100	100	95-100	75-95	30-40	10-20
	12-30	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-100	40-55	15-25
	30-60	Stratified silt loam to silty clay loam.	CL	A-6	0	100	100	95-100	75-95	25-40	10-20
Pr*. Pits											
PtA---------------- Proctor	0-16	Silt loam-------	CL	A-6	0	100	100	95-100	85-100	25-40	10-22
	16-65	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	95-100	90-100	85-100	65-90	25-50	10-25
	65-70	Stratified loam to sand.	SC, CL, SM-SC, CL-ML	A-2, A-4, A-6	0	85-100	80-100	50-100	25-80	20-40	5-20
Ra----------------- Ragsdale	0-14	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	14-50	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	50-60	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
RdA---------------- Raub	0-11	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-95	25-35	5-15
	11-35	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	80-95	35-55	20-35
	35-46	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	85-95	60-85	35-50	15-25
	46-60	Loam, clay loam	CL, ML, SC, SM	A-4, A-6	0-5	85-95	80-90	70-85	40-65	15-30	NP-15
Re----------------- Reesville	0-10	Silt loam-------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	24-36	4-10
	10-38	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	22-50	4-28
	38-60	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-90	20-40	3-18
RuB---------------- Russell	0-8	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	20-35	5-15
	8-26	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-35
	26-68	Clay loam, loam	CL	A-6, A-7	0	90-100	90-95	80-90	65-75	35-50	17-31
Sa----------------- Sable	0-16	Silty clay loam	CL, OH, CH, OL	A-7	0	100	100	98-100	95-100	41-65	15-35
	16-48	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	98-100	95-100	40-55	20-35
	48-60	Silt loam-------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Sc*:											
Sable	0-14	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	40-55	20-30
	14-43	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	41-55	20-30
	43-53	Silt loam	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	15-25
	53-60	Stratified silt loam to sand.	ML, CL, SM, SC	A-2, A-4, A-6	0	95-100	90-100	50-90	12-75	20-35	3-12
Drummer	0-14	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	72-95	30-50	15-30
	14-39	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	100	95-100	85-100	70-90	30-50	15-30
	39-62	Loam, silt loam, clay loam.	CL	A-6, A-7	0-5	95-100	90-100	75-95	60-85	30-50	15-30
	62-70	Loam	CL	A-4, A-6	0-5	95-100	85-95	75-95	50-80	20-35	7-20
Sd Saranac	0-16	Silty clay loam	CL	A-6, A-4	0	100	95-100	85-100	70-95	25-40	8-20
	16-49	Clay loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	95-100	90-100	70-90	35-55	20-35
	49-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	100	95-100	90-100	70-90	40-55	20-35
St Sleeth	0-12	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	90-100	75-95	50-85	20-35	3-15
	12-38	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	85-95	85-95	80-90	65-75	30-40	15-25
	38-50	Gravelly clay loam, gravelly sandy clay loam, gravelly loam.	CL	A-6	0-3	65-95	60-85	55-70	50-70	30-40	15-25
	50-60	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Su Sloan	0-13	Silt loam	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	13-50	Loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	50-60	Stratified silty clay loam to sand.	ML, CL	A-4, A-6	0	95-100	90-100	80-95	65-90	25-40	3-15
Sx Starks	0-10	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	22-35	5-15
	10-28	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-45	15-24
	28-55	Sandy clay loam, silt loam, fine sandy loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	0	95-100	90-100	80-95	40-80	20-40	6-17
	55-67	Stratified loamy sand to silt loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-5	90-100	80-95	40-90	30-60	<30	NP-15
Ty Treaty	0-13	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	13-36	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	36-64	Clay loam, loam	CL	A-6, A-7	0	95-100	85-100	75-95	55-85	28-48	12-25
	64-70	Loam	CL-ML, CL	A-4, A-6	0	90-100	85-95	75-90	55-75	20-30	6-15
Ud*. Udorthents											
Wa Wallkill	0-9	Silt loam	ML, SM, OL	A-5, A-7	0	95-100	90-100	70-100	40-90	40-50	5-15
	9-22	Silt loam, loam	CL, CL-ML, SM-SC, SC	A-4	0	75-100	70-100	60-100	40-90	15-25	5-10
	22-60	Sapric material, hemic material, silt loam.	Pt	A-8	0	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
We----------------- Westland	0-9	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-90	30-45	10-25
	9-46	Clay loam--------	CL	A-6, A-7	0	95-100	90-100	80-90	65-75	35-50	15-30
	46-54	Gravelly clay loam.	CL	A-6, A-7	0-5	65-75	60-70	55-70	50-70	30-50	15-30
	54-60	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Wh----------------- Whitaker	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
	14-44	Clay loam, sandy loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	44-70	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9
XeA, XeB----------- Xenia	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	13-43	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	43-60	Loam-------------	CL	A-6, A-7	0-5	92-100	90-95	75-95	65-75	35-50	15-30

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
Be----------------- Brenton	0-11	0.6-2.0	0.22-0.24	6.1-7.3	Low------------	0.28	5	6
	11-40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-------	0.28		
	40-60	0.6-2.0	0.11-0.20	6.1-8.4	Low------------	0.28		
CbA---------------- Camden Variant	0-12	0.6-2.0	0.23-0.25	5.1-6.5	Moderate-------	0.37	5	6
	12-32	0.6-2.0	0.16-0.22	5.1-6.5	Moderate-------	0.37		
	32-48	0.6-2.0	0.12-0.14	5.1-6.5	Low------------	0.28		
	48-65	0.6-2.0	0.19-0.21	5.6-7.8	Low------------	0.28		
	65-80	0.6-2.0	0.05-0.19	6.6-8.4	Low------------	0.28		
Ce----------------- Ceresco	0-14	2.0-6.0	0.13-0.22	6.1-7.8	Low------------	0.20	5	3
	14-60	0.6-6.0	0.08-0.13	6.1-8.4	Low------------	0.20		
Cy----------------- Cyclone	0-14	0.6-2.0	0.23-0.25	6.1-7.3	Low------------	0.28	5	6
	14-49	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-------	0.43		
	49-60	0.6-2.0	0.15-0.19	6.6-7.8	Moderate-------	0.43		
	60-70	0.2-0.6	0.05-0.19	7.4-8.4	Low------------	0.43		
DaA, DaB----------- Dana	0-10	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.32	5	5
	10-29	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-------	0.43		
	29-40	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-------	0.43		
	40-60	0.2-0.6	0.05-0.19	6.6-8.4	Low------------	0.43		
Dr----------------- Drummer	0-14	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-------	0.28	5	7
	14-39	0.6-2.0	0.21-0.24	5.6-7.3	Moderate-------	0.28		
	39-62	0.6-2.0	0.17-0.20	6.1-8.4	Moderate-------	0.28		
	62-70	0.6-2.0	0.11-0.19	6.6-8.4	Low------------	0.28		
FcA---------------- Fincastle	0-13	0.6-2.0	0.22-0.24	5.1-6.5	Low------------	0.37	5	5
	13-32	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-------	0.37		
	32-59	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-------	0.37		
	59-70	0.06-0.2	0.05-0.19	7.4-8.4	Low------------	0.37		
FdA*:								
Fincastle---------	0-13	0.6-2.0	0.22-0.24	5.1-6.5	Low------------	0.37	5	5
	13-32	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-------	0.37		
	32-59	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-------	0.37		
	59-70	0.06-0.2	0.05-0.19	7.4-8.4	Low------------	0.37		
Crosby------------	0-8	0.6-2.0	0.20-0.24	5.1-6.5	Low------------	0.43	3	5
	8-31	0.06-0.2	0.15-0.20	5.1-7.3	Moderate-------	0.43		
	31-60	0.06-0.2	0.05-0.19	7.9-8.4	Low------------	0.43		
FsB---------------- Fox	0-8	0.6-2.0	0.20-0.24	5.1-7.3	Low------------	0.32	4	5
	8-11	0.6-2.0	0.15-0.22	5.1-7.3	Moderate-------	0.32		
	11-35	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-------	0.32		
	35-60	>6.0	0.02-0.04	7.9-8.4	Low------------	0.10		
FsC---------------- Fox	0-6	0.6-2.0	0.20-0.24	5.1-7.3	Low------------	0.32	4	5
	6-32	0.6-2.0	0.15-0.19	5.6-7.8	Moderate-------	0.32		
	32-60	>6.0	0.02-0.04	7.9-8.4	Low------------	0.10		
Gn----------------- Genesee	0-9	0.6-2.0	0.20-0.24	6.1-7.8	Low------------	0.37	5	5
	9-40	0.6-2.0	0.17-0.22	6.1-8.4	Low------------	0.37		
	40-49	0.6-2.0	0.19-0.21	7.4-8.4	Low------------	0.37		
	49-60	6.0-20	0.05-0.07	7.4-8.4	Low------------	0.17		
HeF---------------- Hennepin	0-4	0.6-2.0	0.18-0.24	6.1-7.8	Low------------	0.32	4	5
	4-11	0.2-0.6	0.14-0.22	6.1-7.8	Low------------	0.32		
	11-60	0.2-0.6	0.07-0.11	6.1-8.4	Low------------	0.32		
Ho----------------- Houghton	0-60	0.2-6.0	0.35-0.45	5.6-7.8	---------------	----	---	3

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
La----------------- Landes	0-10	2.0-6.0	0.16-0.18	6.1-8.4	Low------------	0.20	5	3
	10-60	6.0-20	0.05-0.15	6.1-8.4	Low------------	0.20		
Ma----------------- Mahalasville	0-16	0.2-0.6	0.21-0.23	6.6-7.3	Moderate------	0.28	5	7
	16-35	0.06-0.2	0.18-0.20	6.6-7.3	Moderate------	0.28		
	35-44	0.06-0.2	0.17-0.19	7.4-7.8	Low------------	0.28		
	44-60	2.0-6.0	0.19-0.21	7.9-8.4	Low------------	0.28		
McA, McB2--------- Martinsville	0-10	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	10-34	0.6-2.0	0.17-0.20	5.1-6.0	Moderate------	0.37		
	34-58	0.6-2.0	0.12-0.14	5.6-6.5	Low------------	0.24		
	58-75	0.6-2.0	0.19-0.21	7.4-8.4	Low------------	0.24		
MnC, MnD---------- Miami	0-8	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	8-36	0.6-2.0	0.15-0.20	5.6-6.0	Moderate------	0.37		
	36-60	0.2-0.6	0.05-0.19	6.6-8.4	Low------------	0.37		
MsC3, MsD3-------- Miami	0-6	0.6-2.0	0.18-0.20	5.6-7.3	Moderate------	0.37	4	6
	6-28	0.6-2.0	0.15-0.20	5.6-6.0	Moderate------	0.37		
	28-60	0.2-0.6	0.05-0.19	6.6-8.4	Low------------	0.37		
MtB*:								
Miami------------	0-8	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	8-36	0.6-2.0	0.15-0.20	5.6-6.0	Moderate------	0.37		
	36-60	0.2-0.6	0.05-0.19	6.6-8.4	Low------------	0.37		
Crosby-----------	0-8	0.6-2.0	0.20-0.24	5.1-6.5	Low------------	0.43	3	5
	8-31	0.06-0.2	0.15-0.20	5.1-7.3	Moderate------	0.43		
	31-60	0.06-0.6	0.05-0.19	7.9-8.4	Low------------	0.43		
MwA*:								
Miami------------	0-8	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	8-36	0.6-2.0	0.15-0.20	5.6-6.0	Moderate------	0.37		
	36-60	0.2-2.0	0.05-0.19	6.6-8.4	Low------------	0.37		
Martinsville-----	0-10	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	10-34	0.6-2.0	0.17-0.20	5.1-6.0	Moderate------	0.37		
	34-58	0.6-2.0	0.12-0.14	5.6-6.5	Low------------	0.24		
	58-60	0.6-2.0	0.19-0.21	7.4-8.4	Low------------	0.24		
Mx----------------- Milford	0-17	0.6-2.0	0.12-0.23	6.1-7.3	High-----------	0.28	5	4
	17-38	0.06-0.2	0.18-0.20	5.1-6.5	Moderate------	0.43		
	38-60	0.2-0.6	0.20-0.22	7.4-8.4	Moderate------	0.43		
OcA, OcB---------- Ockley	0-9	0.6-2.0	0.20-0.24	5.6-6.5	Low------------	0.37	5	5
	9-25	0.6-2.0	0.15-0.20	4.5-6.0	Moderate------	0.37		
	25-51	0.6-2.0	0.12-0.14	5.6-6.5	Moderate------	0.24		
	51-60	>20	0.02-0.04	7.4-8.4	Low------------	0.10		
Pc----------------- Palms	0-26	2.0-6.0	0.35-0.45	5.1-8.4	---------------	----	---	3
	26-60	0.2-2.0	0.14-0.22	6.1-8.4	Low------------	----		
PgB---------------- Parr	0-10	0.6-2.0	0.21-0.24	5.6-7.3	Low------------	0.32	5-4	5
	10-37	0.6-2.0	0.15-0.19	5.6-6.5	Moderate------	0.32		
	37-60	0.06-0.2	0.05-0.19	7.4-8.4	Low------------	0.32		
Pn----------------- Patton	0-12	0.6-2.0	0.21-0.23	6.6-7.3	Moderate------	0.28	5	7
	12-30	0.6-2.0	0.18-0.20	6.1-7.8	Moderate------	0.28		
	30-60	0.6-2.0	0.18-0.22	7.4-8.4	Moderate------	0.28		
Pr*. Pits								
PtA---------------- Proctor	0-16	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.32	5	6
	16-65	0.6-2.0	0.15-0.20	5.6-6.5	Moderate------	0.43		
	65-70	2.0-6.0	0.07-0.19	6.1-7.3	Low------------	0.43		

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
Ra----------------- Ragsdale	0-14	0.6-2.0	0.22-0.24	6.1-7.3	Low------------	0.28	5	5
	14-50	0.06-0.2	0.18-0.20	6.1-7.3	Moderate------	0.28		
	50-60	0.06-0.2	0.20-0.22	6.6-8.4	Low------------	0.28		
RdA--------------- Raub	0-11	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.28	5	5
	11-35	0.2-0.6	0.18-0.20	5.1-6.5	Moderate------	0.37		
	35-46	0.2-0.6	0.15-0.19	6.1-7.3	Moderate------	0.37		
	46-60	0.2-0.6	0.05-0.19	7.4-8.4	Low------------	0.37		
Re----------------- Reesville	0-10	0.6-2.0	0.17-0.24	5.6-7.3	Low------------	0.37	5	6
	10-38	0.6-2.0	0.15-0.19	5.1-8.4	Moderate------	0.37		
	38-60	0.6-2.0	0.15-0.18	7.4-8.4	Low------------	0.37		
RuB--------------- Russell	0-8	0.6-2.0	0.21-0.24	5.6-7.3	Low------------	0.37	5	5
	8-26	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37		
	26-68	0.6-2.0	0.15-0.19	5.6-7.3	Moderate------	0.37		
Sa----------------- Sable	0-16	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.28	5	4
	16-48	0.6-2.0	0.18-0.20	6.1-7.8	Moderate------	0.28		
	48-60	0.6-2.0	0.20-0.22	6.6-7.8	Low------------	0.28		
Sc*:								
Sable------------	0-14	0.6-2.0	0.21-0.23	6.1-7.3	Moderate------	0.28	5	4
	14-43	0.6-2.0	0.18-0.20	6.6-7.3	Moderate------	0.43		
	43-53	0.6-2.0	0.18-0.20	6.6-7.3	Moderate------	0.43		
	53-60	0.6-6.0	0.19-0.21	6.6-8.4	Low------------	0.43		
Drummer----------	0-14	0.6-2.0	0.21-0.23	5.6-7.3	Moderate------	0.28	5	7
	14-39	0.6-2.0	0.21-0.24	5.6-7.3	Moderate------	0.28		
	39-62	0.6-2.0	0.17-0.20	6.1-8.4	Moderate------	0.28		
	62-70	0.6-2.0	0.11-0.19	6.6-8.4	Low------------	0.28		
Sd----------------- Saranac	0-16	0.2-0.6	0.17-0.22	6.1-7.8	Moderate------	0.24	5	6
	16-49	0.2-0.6	0.10-0.20	6.1-7.8	Moderate------	0.24		
	49-60	0.2-0.6	0.10-0.20	6.6-8.4	Moderate------	0.24		
St----------------- Sleeth	0-12	0.6-2.0	0.20-0.24	6.6-7.3	Low------------	0.32	5	5
	12-38	0.6-2.0	0.15-0.19	5.6-6.5	Moderate------	0.32		
	38-50	0.6-2.0	0.14-0.16	6.6-8.4	Moderate------	0.32		
	50-60	>20	0.02-0.04	7.9-8.4	Low------------	0.10		
Su----------------- Sloan	0-13	0.6-2.0	0.20-0.24	6.1-7.8	Low------------	0.37	5	6
	13-50	0.6-2.0	0.15-0.19	6.1-8.4	Moderate------	0.37		
	50-60	0.6-2.0	0.13-0.18	6.6-8.4	Low------------	0.37		
Sx----------------- Starks	0-10	0.6-2.0	0.22-0.24	5.6-6.5	Moderate------	0.37	5	6
	10-28	0.2-2.0	0.18-0.20	5.1-6.5	Moderate------	0.37		
	28-55	0.2-2.0	0.16-0.19	5.1-7.3	Moderate------	0.37		
	55-67	2.0-6.0	0.08-0.18	5.6-7.3	Very low------	0.37		
Ty----------------- Treaty	0-13	0.6-2.0	0.23-0.25	6.1-7.3	Low------------	0.32	5	6
	13-36	0.6-2.0	0.18-0.20	6.1-7.3	Moderate------	0.43		
	36-64	0.6-2.0	0.15-0.19	6.6-7.8	Moderate------	0.43		
	64-70	0.2-0.6	0.17-0.19	7.4-8.4	Low------------	0.43		
Ud*. Udorthents								
Wa----------------- Wallkill	0-9	0.6-2.0	0.16-0.21	5.1-7.3	Low------------	0.49	3	---
	9-22	0.6-2.0	0.15-0.20	5.1-7.3	Low------------	0.43		
	22-60	2.0-6.0	0.19-0.22	5.6-7.3	Low------------	----		
We----------------- Westland	0-9	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.28	5	7
	9-46	0.06-0.2	0.15-0.19	5.6-7.3	Moderate------	0.28		
	46-54	0.06-0.2	0.14-0.16	5.6-7.3	Moderate------	0.28		
	54-60	>20	0.02-0.04	7.4-8.4	Low------------	0.10		

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
Wh----------------- Whitaker	0-14	0.6-2.0	0.20-0.24	5.6-7.3	Low------------	0.37	5	5
	14-44	0.6-2.0	0.15-0.19	5.1-6.0	Moderate------	0.37		
	44-70	0.6-6.0	0.19-0.21	6.6-8.4	Low------------	0.37		
XeA, XeB---------- Xenia	0-13	0.6-2.0	0.22-0.24	6.6-7.3	Low------------	0.37	5	5
	13-43	0.2-0.6	0.18-0.20	5.1-6.0	Moderate------	0.37		
	43-60	0.2-0.6	0.15-0.19	5.1-7.3	Moderate------	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[See text for definitions of terms such as "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth*	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Be----------------- Brenton	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
CbA---------------- Camden Variant	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
Ce----------------- Ceresco	B	Occasional	Long------	Mar-May	1.0-2.0	Apparent	Sep-May	>60	---	High-----	Low------	Low.
Cy----------------- Cyclone	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
DaA, DaB----------- Dana	B	None---------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	Moderate.
Dr----------------- Drummer	B/D	None---------	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
FcA---------------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FdA**:												
Fincastle---------	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Crosby------------	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FsB, FsC----------- Fox	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Gn----------------- Genesee	B	Occasional	Brief-----	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
HeF---------------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ho----------------- Houghton	A/D	None---------	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
La----------------- Landes	B	Occasional	Brief-----	Jan-Apr	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ma----------------- Mahalasville	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
McA, McB2---------- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MnC, MnD, MsC3, MsD3 Miami	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MtB**:												
Miami	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Crosby	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
MwA**:												
Miami	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Martinsville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mx Milford	B/D	None	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High	High	Low.
OcA, OcB Ockley	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pc Palms	A/D	None	---	---	+.5-1.0	Apparent	Nov-May	>60	---	High	High	Moderate.
PgB Parr	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pn Patton	B/D	None	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High	High	Low.
Pr**: Pits												
PtA Proctor	B	None	---	---	2.5-6.0	Apparent	Jan-May	>60	---	High	Moderate	Moderate.
Ra Ragsdale	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
RdA Raub	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
Re Reesville	C	None	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	High	High	Low.
RuB Russell	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Sa Sable	B/D	None	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High	High	Low.
Sc**:												
Sable	B/D	None	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High	High	Low.
Drummer	B/D	None	---	---	+.5-2.0	Apparent	Dec-May	>60	---	High	High	Moderate.

See footnotes at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth*	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Sd----------------- Saranac	C/D	Occasional	Brief------	Jan-Dec	+.5-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
St----------------- Sleeth	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High------	High------	Low.
Su----------------- Sloan	B/D	Frequent----	Very brief	Nov-Jun	+.5-1.0	Apparent	Nov-Jun	>60	---	High------	High------	Low.
Sx----------------- Starks	C	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High------	High------	Moderate.
Ty----------------- Treaty	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
Ud**. Udorthents												
Wa----------------- Wallkill	D	None---------	---	---	+.5-0.5	Apparent	Sep-Jun	>60	---	High------	Moderate	Moderate.
We----------------- Westland	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High------	High------	Low.
Wh----------------- Whitaker	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High------	High------	Moderate.
XeA, XeB----------- Xenia	B	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High------	High------	Moderate.

* A plus sign under "High water table--Depth" indicates ponding.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Brenton	Fine-silty, mixed, mesic Aquic Argiudolls
Camden Variant	Fine-silty, mixed, mesic Typic Hapludalfs
Ceresco	Coarse-loamy, mixed, mesic Fluvaquentic Hapludolls
*Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
Dana	Fine-silty, mixed, mesic Typic Argiudolls
Drummer	Fine-silty, mixed, mesic Typic Haplaquolls
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Houghton	Euic, mesic Typic Medisaprists
Landes	Coarse-loamy, mixed, mesic Fluventic Hapludolls
Mahalasville	Fine-silty, mixed, mesic Typic Argiaquolls
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Parr	Fine-loamy, mixed, mesic Typic Argiudolls
Patton	Fine-silty, mixed, mesic Typic Haplaquolls
Proctor	Fine-silty, mixed, mesic Typic Argiudolls
Ragsdale	Fine-silty, mixed, mesic Typic Argiaquolls
Raub	Fine-silty, mixed, mesic Aquic Argiudolls
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Sable	Fine-silty, mixed, mesic Typic Haplaquolls
Saranac	Fine, mixed, mesic Fluvaquentic Haplaquolls
Sleeth	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
*Starks	Fine-silty, mixed, mesic Aeric Ochraqualfs
Treaty	Fine-silty, mixed, mesic Typic Argiaquolls
Udorthents	Loamy, mixed, mesic Typic Udorthents
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Westland	Fine-loamy, mixed, mesic Typic Argiaquolls
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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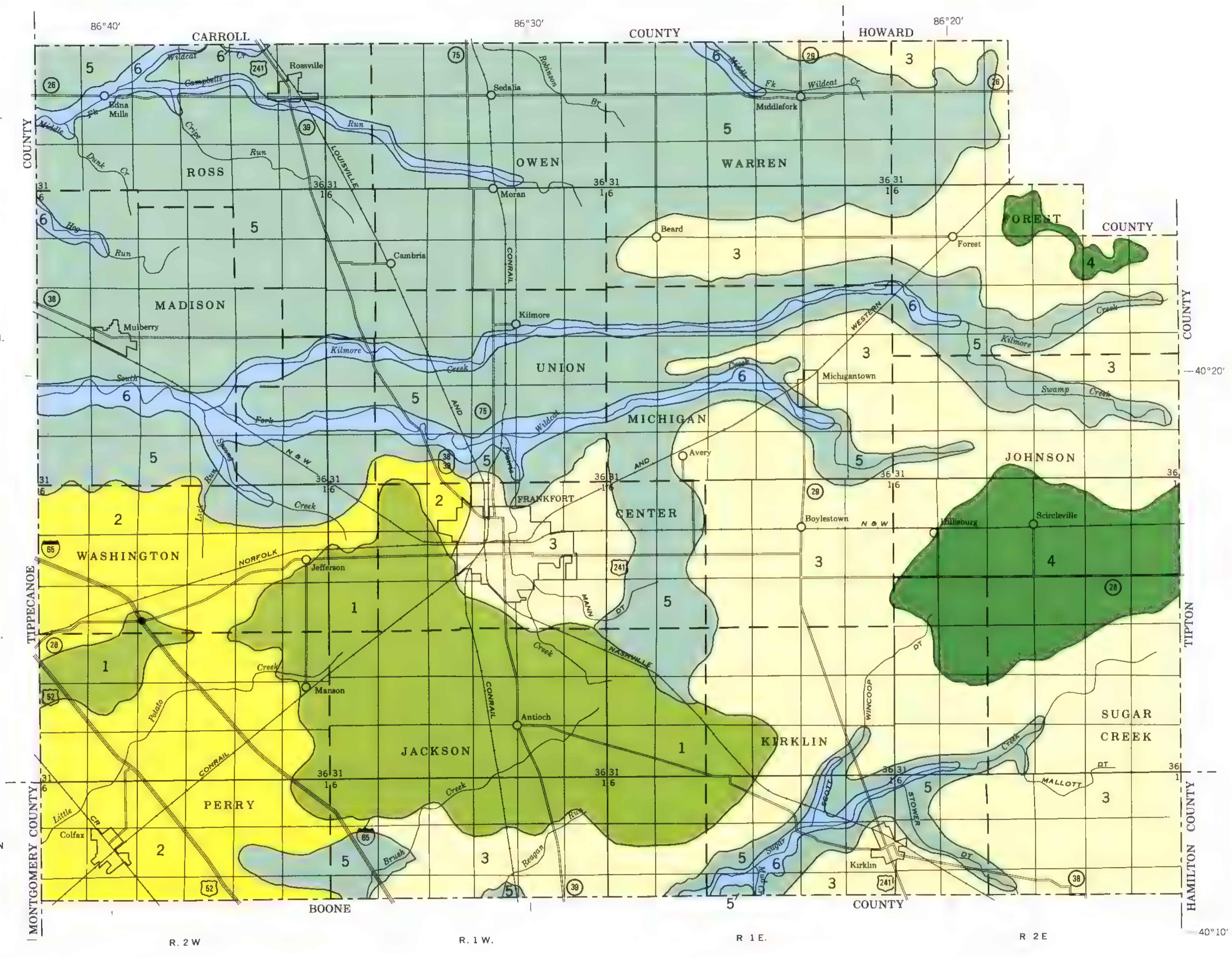
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES,
SOIL AND WATER CONSERVATION COMMITTEE

GENERAL SOIL MAP

CLINTON COUNTY, INDIANA

Scale 1:126,720



SOIL LEGEND*

1	Drummer-Raub: Nearly level poorly drained and somewhat poorly drained, silty soils, on till plains
2	Ragsdale-Fincastle: Nearly level, very poorly drained and somewhat poorly drained, silty soils, on till plains
3	Cyclone-Fincastle-Crosby: Nearly level and gently sloping, poorly drained and somewhat poorly drained, silty soils, on till plains
4	Sable-Drummer: Nearly level, poorly drained, silty soils, on till plains
5	Miami-Crosby-Fincastle: Strongly sloping to nearly level, well drained and somewhat poorly drained silty and loamy soils, on till plains
6	Ceresco-Ockley: Nearly level and gently sloping, somewhat poorly drained and well drained, loamy and silty soils; on flood plains and terraces

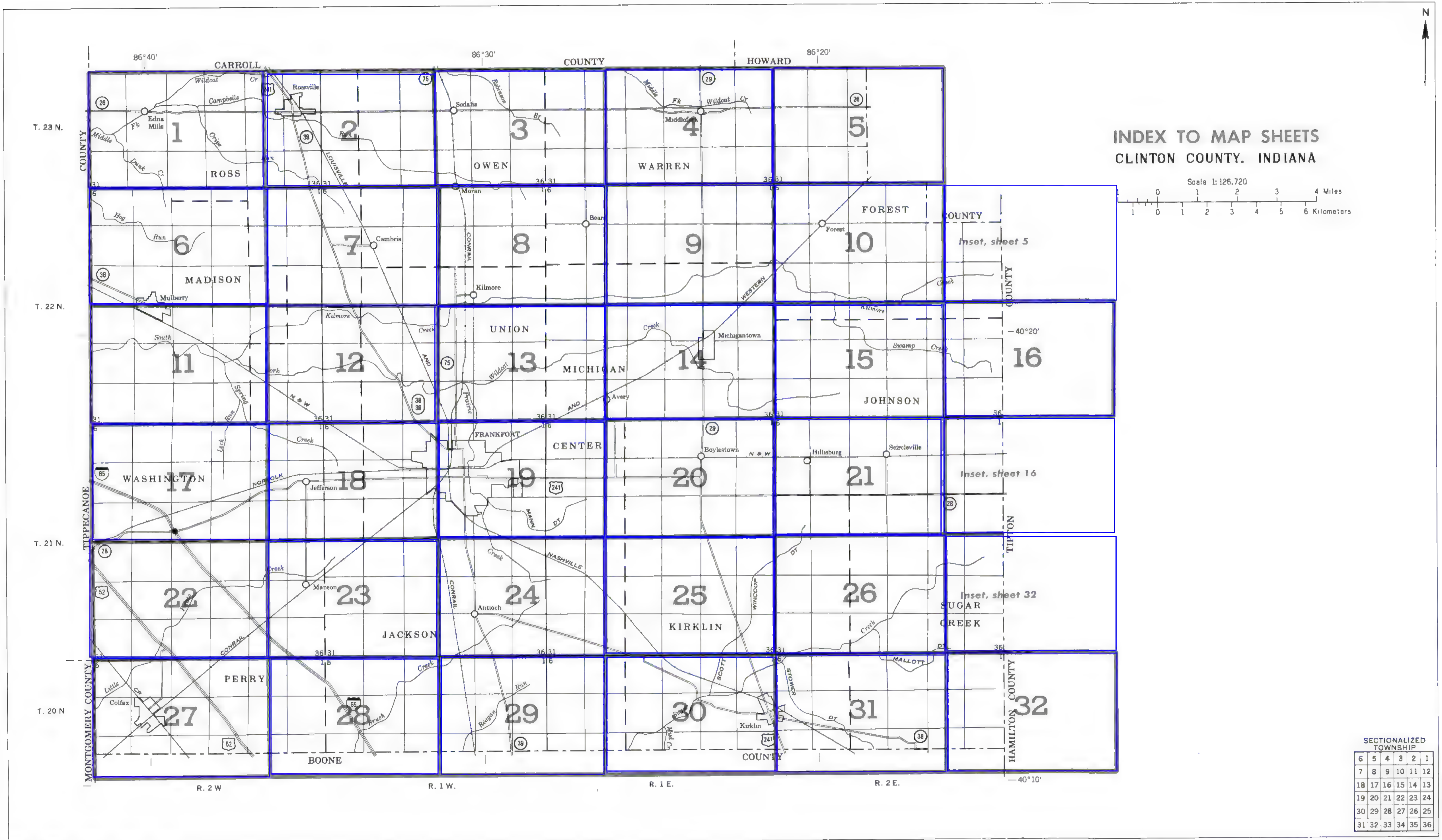
*The texture terms in the descriptive headings refer to the surface layer of the major soils in the map units

Compiled 1979

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.


INDEX TO MAP SHEETS
CLINTON COUNTY, INDIANA
Scale 1:126,720
4 Miles
6 Kilometers
N
CARROLL COUNTY
HOWARD
TIPPECANOE COUNTY
TIPTON COUNTY
HAMILTON COUNTY
MONTGOMERY COUNTY
BOONE COUNTY
86°40′
86°30′
86°20′
40°20′
40°10′
T. 23 N.
T. 22 N.
T. 21 N.
T. 20 N
R. 2 W
R. 1 W.
R. 1 E.
R. 2 E.
ROSS
OWEN
WARREN
MADISON
FOREST
UNION
MICHIGAN
JOHNSON
WASHINGTON
CENTER
JACKSON
KIRKLIN
SUGAR CREEK
PERRY
Edna Mills
Rossville
Sedalia
Middlefork
Moran
Bear
Cambria
Forest
Kilmore
Mulberry
Michigantown
Avery
FRANKFORT
Boylestown
Hillisburg
Scircleville
Jefferson
Manson
Antioch
Colfax
Kirklin
Inset, sheet 5
Inset, sheet 16
Inset, sheet 32
SECTIONALIZED TOWNSHIP
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and numbers. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded and 3 that it is severely eroded.

SYMBOL	NAME
Be	Brenton silt loam
CbA	Camden Variant silt loam, 0 to 2 percent slopes
Ce	Ceresco loam
Cy	Cyclone silt loam
DaA	Dana silt loam, 0 to 2 percent slopes
DaB	Dana silt loam, 2 to 6 percent slopes
Dr	Drummer silty clay loam
FcA	Fincastle silt loam, 0 to 2 percent slopes
FdA	Fincastle-Crosby silt loams, 0 to 3 percent slopes
FsB	Fox silt loam, 2 to 6 percent slopes
FsC	Fox loam, 6 to 15 percent slopes
Gn	Genesee silt loam, sandy substratum
HeF	Hennepin silt loam, 18 to 50 percent slopes
Ho	Houghton muck, undrained
La	Landes fine sandy loam
Ma	Mahalasville silty clay loam
McA	Martinsville silt loam, 0 to 2 percent slopes
McB2	Martinsville silt loam, 2 to 6 percent slopes, eroded
MnC	Miami silt loam, 6 to 12 percent slopes
MnD	Miami silt loam, 12 to 18 percent slopes
MsC3	Miami clay loam, 6 to 12 percent slopes, severely eroded
MsD3	Miami clay loam, 12 to 18 percent slopes, severely eroded
MtB	Miami-Crosby silt loams, 2 to 6 percent slopes
MwA	Miami-Martinsville silt loams, 0 to 2 percent slopes
Mx	Milford silty clay loam
OcA	Ockley silt loam, 0 to 2 percent slopes
OcB	Ockley silt loam, 2 to 6 percent slopes
Pc	Palms muck, undrained
PgB	Parr silt loam, 1 to 5 percent slopes
Pn	Patton silty clay loam
Pr	Pits, gravel
PtA	Proctor silt loam, 0 to 3 percent slopes
Ra	Ragsdale silt loam
RdA	Raub silt loam, 0 to 2 percent slopes
Re	Reesville silt loam
RuB	Russell silt loam, 2 to 6 percent slopes
Sa	Sable silty clay loam
Sc	Sable-Drummer silty clay loams
Sd	Saranac silty clay loam
St	Sleeth silt loam
Su	Sloan silt loam
Sx	Starks silt loam
Ty	Treaty silt loam
Ud	Udorthents, loamy
Wa	Wallkill silt loam
We	Westland silty clay loam
Wh	Whitaker silt loam
XeA	Xenia silt loam, 0 to 2 percent slopes
XeB	Xenia silt loam, 2 to 6 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — GAS
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (Be; MsC3)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

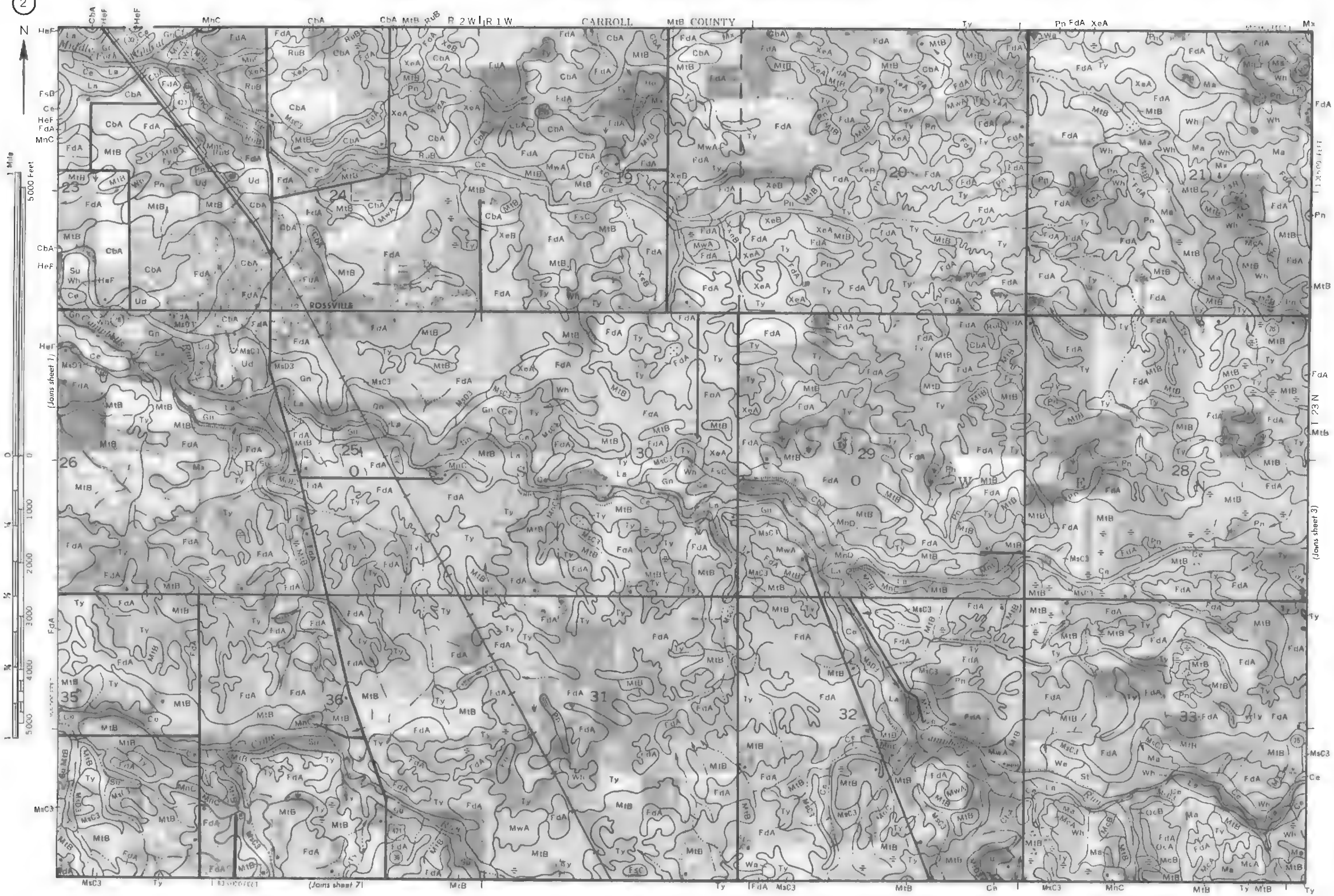
MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Sanitary landfill 3 to 5 acres in size

CLINTON COUNTY, INDIANA — SHEET NUMBER 1

CLINTON COUNTY, INDIANA NO. 1

CLINTON COUNTY, INDIANA — SHEET NUMBER 2



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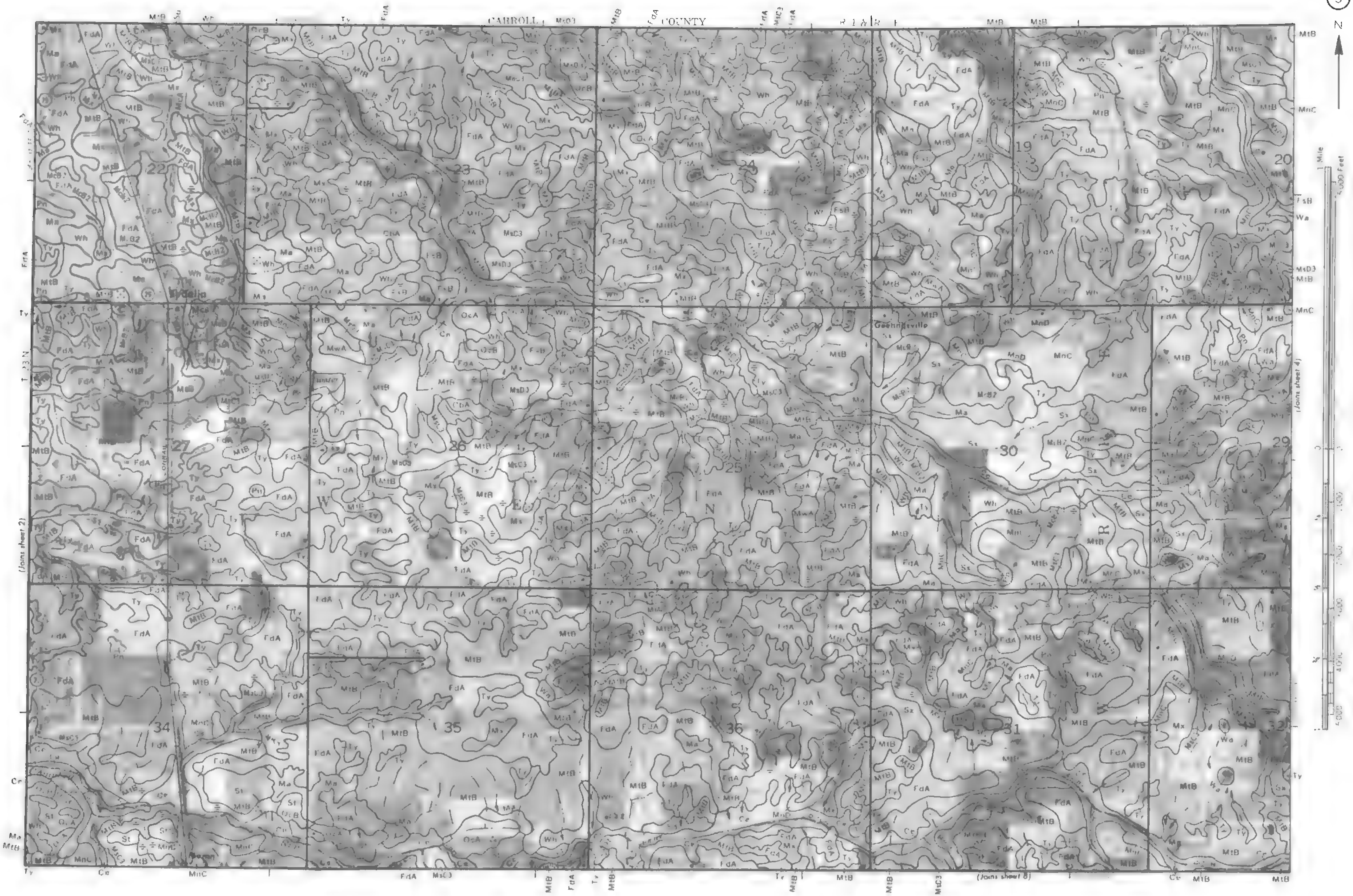
3
N
CARROLL COUNTY
Geetingsville
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 8)
22
23
24
19
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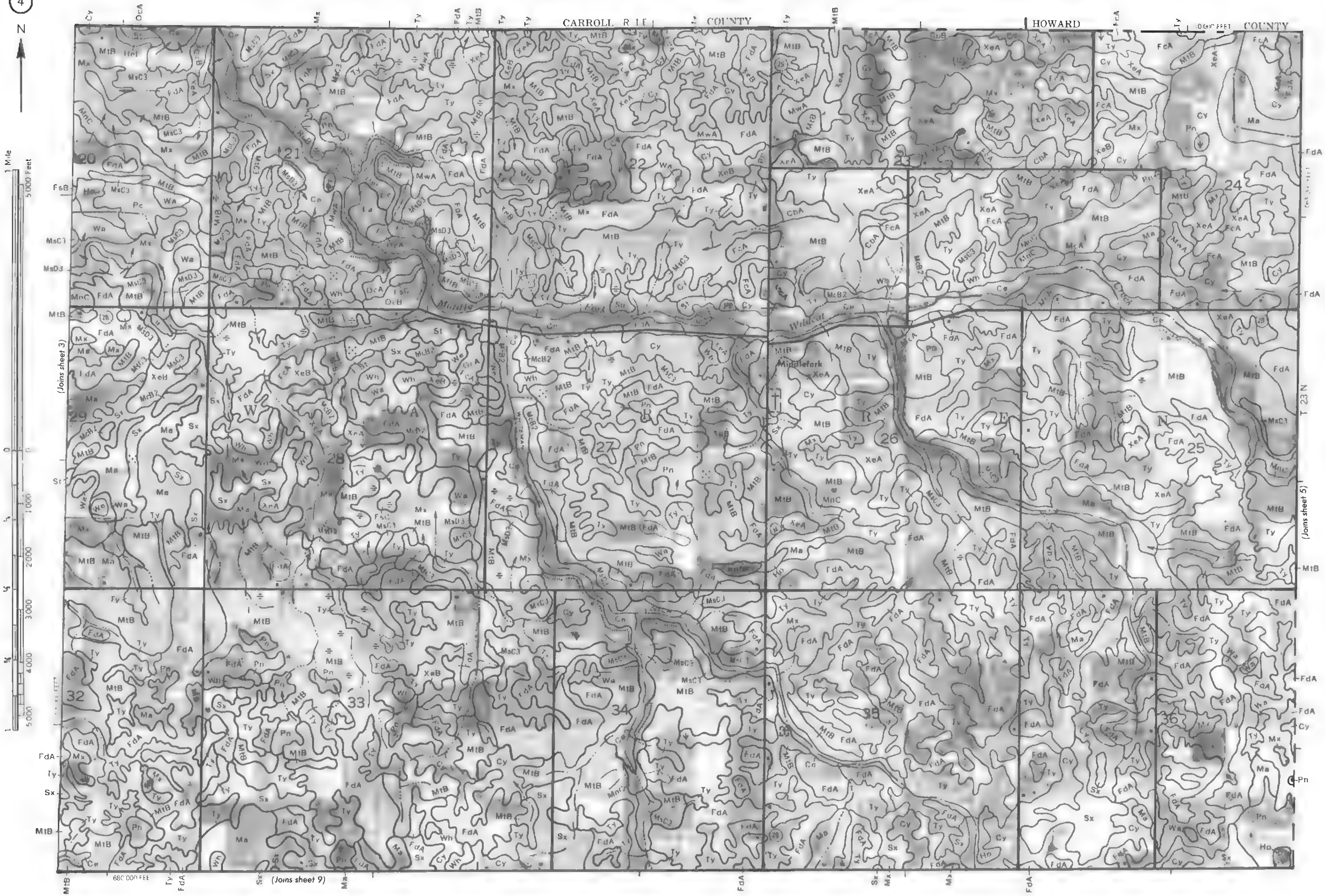
27
26
25
30
29
34
35
36
31
32
1 Mile
5000 Feet

CLINTON COUNTY, INDIANA — SHEET NUMBER 4



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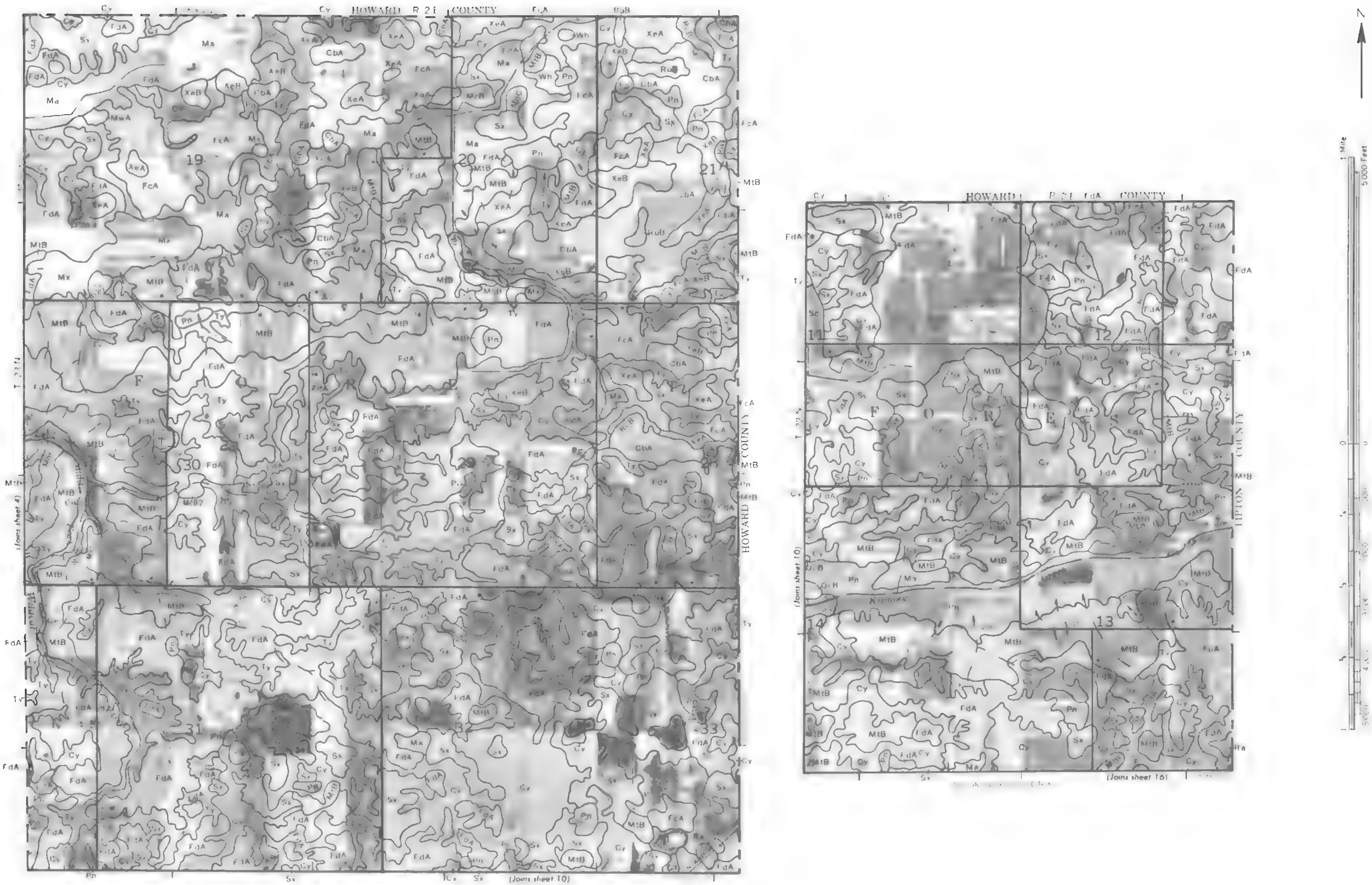
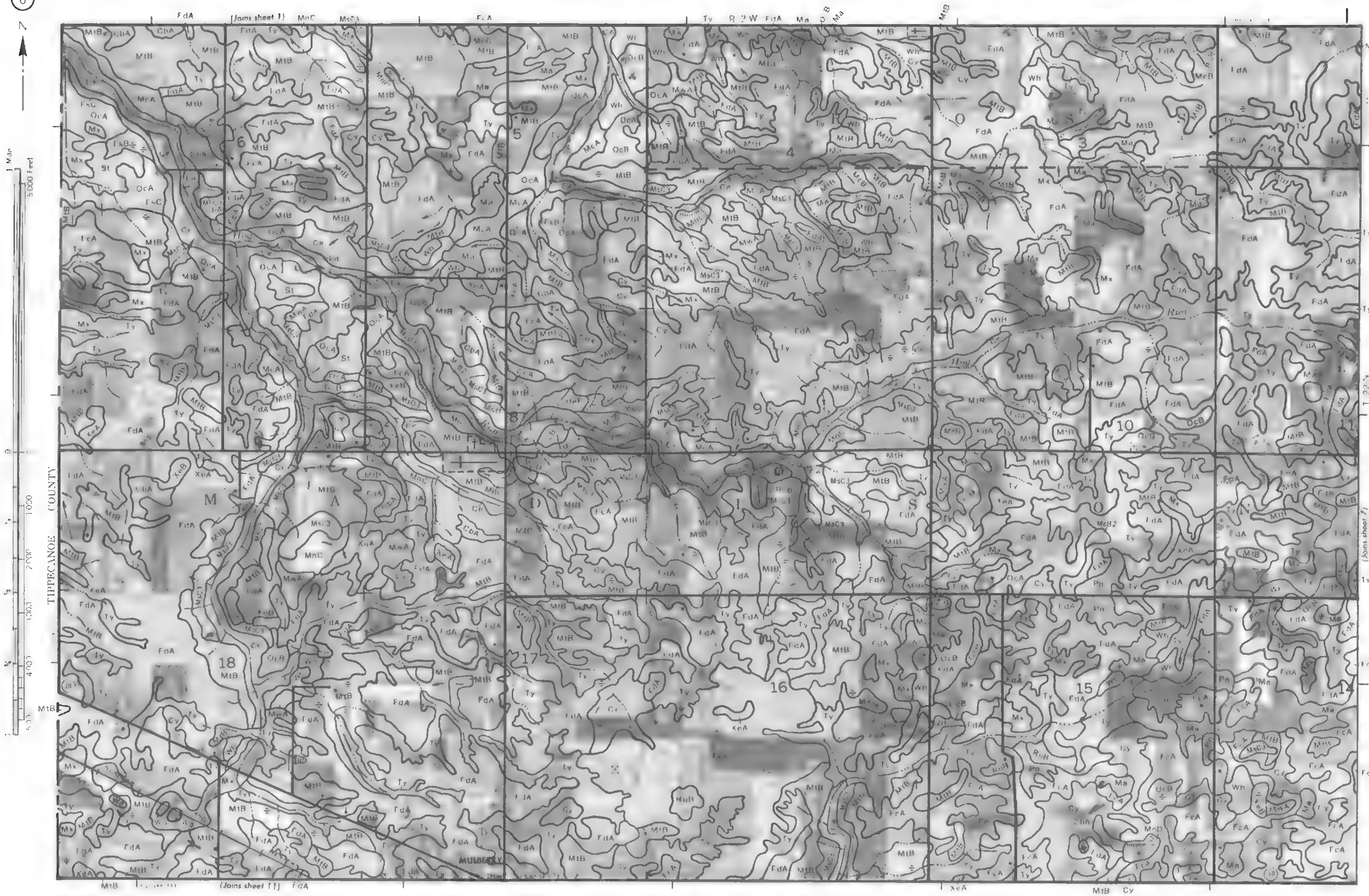


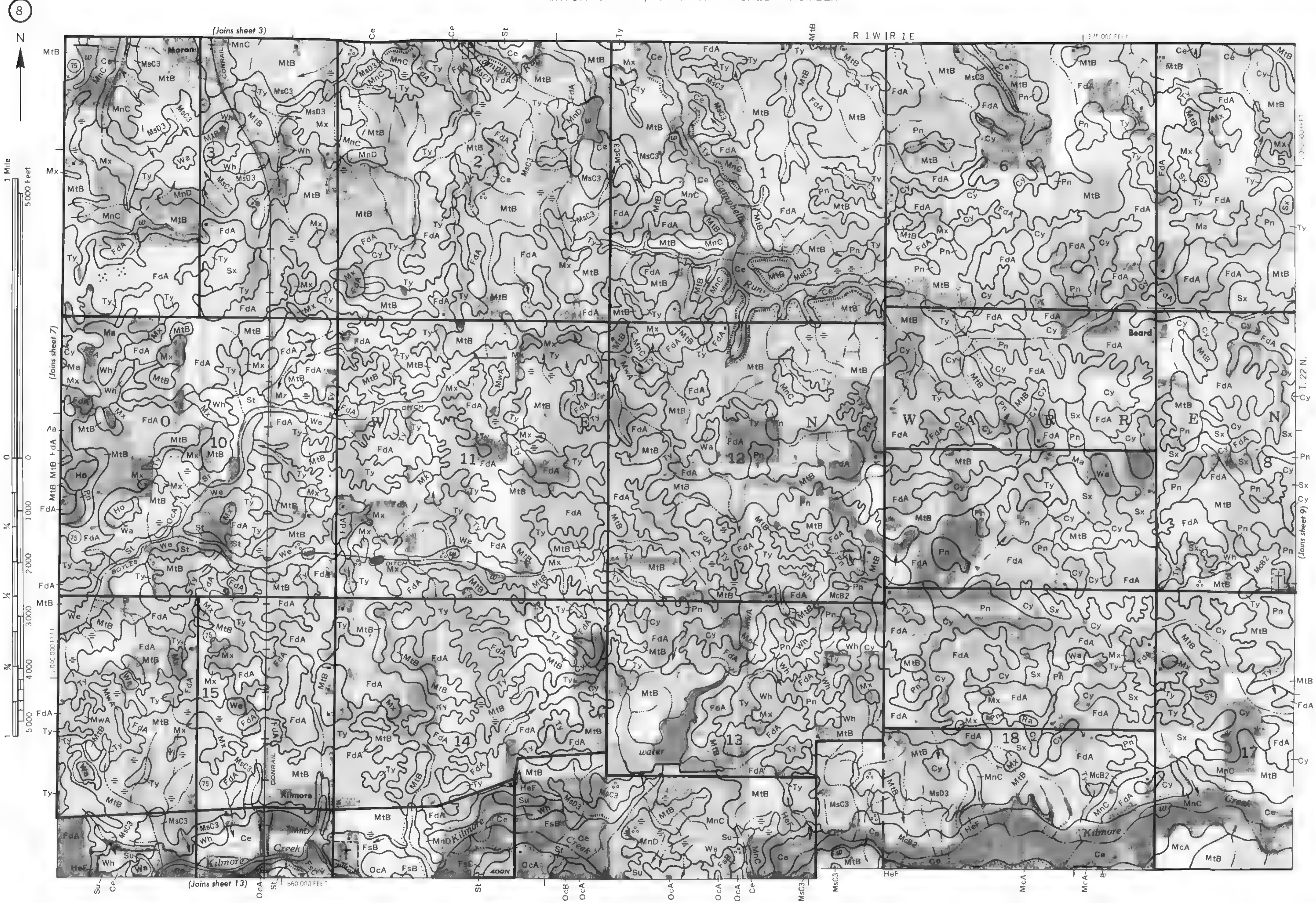
CLINTON COUNTY, INDIANA NO. 5

6



C. NTON COUNTY, INDIANA NO. 6

CLINTON COUNTY, INDIANA — SHEET NUMBER 7



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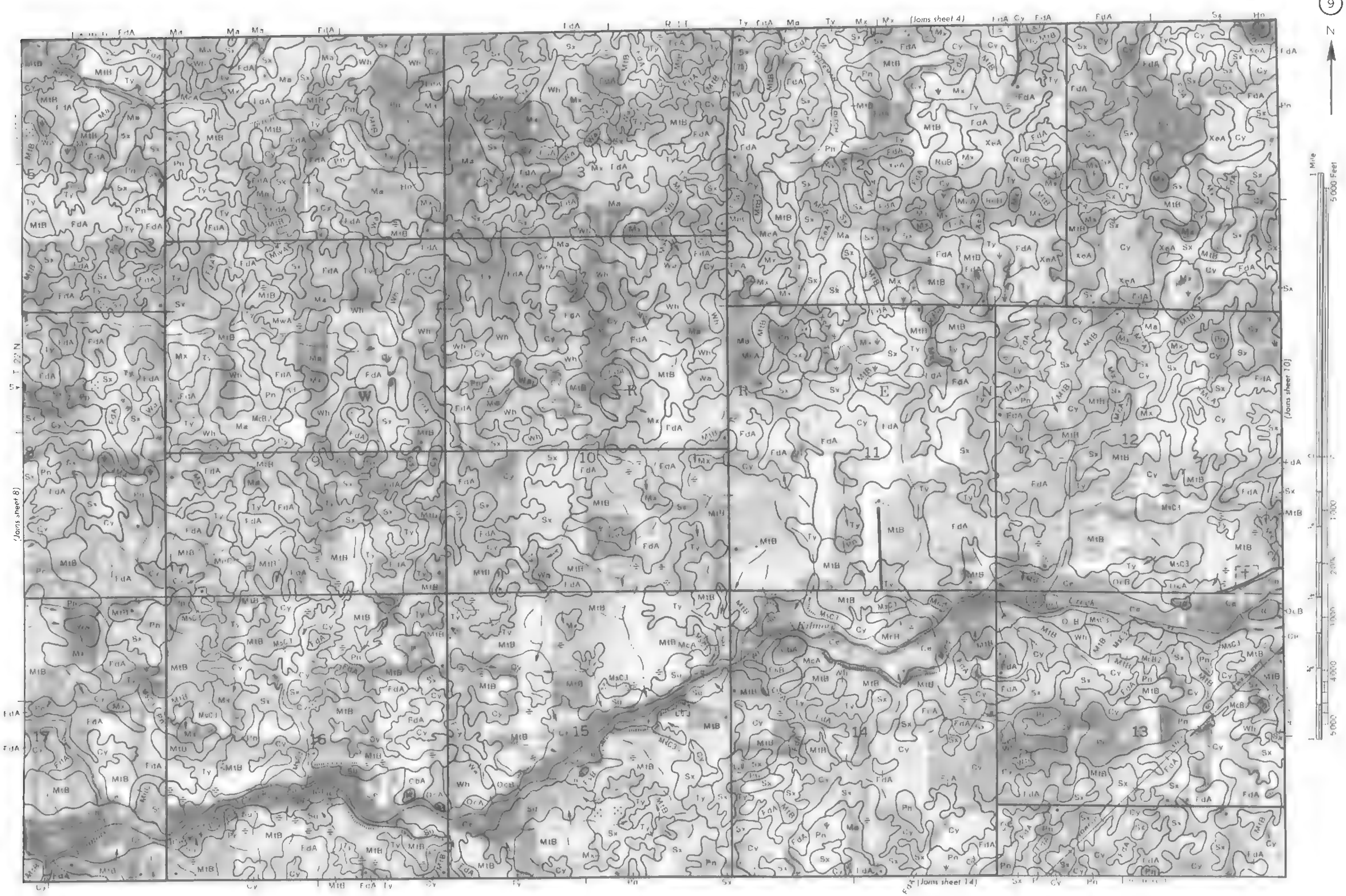
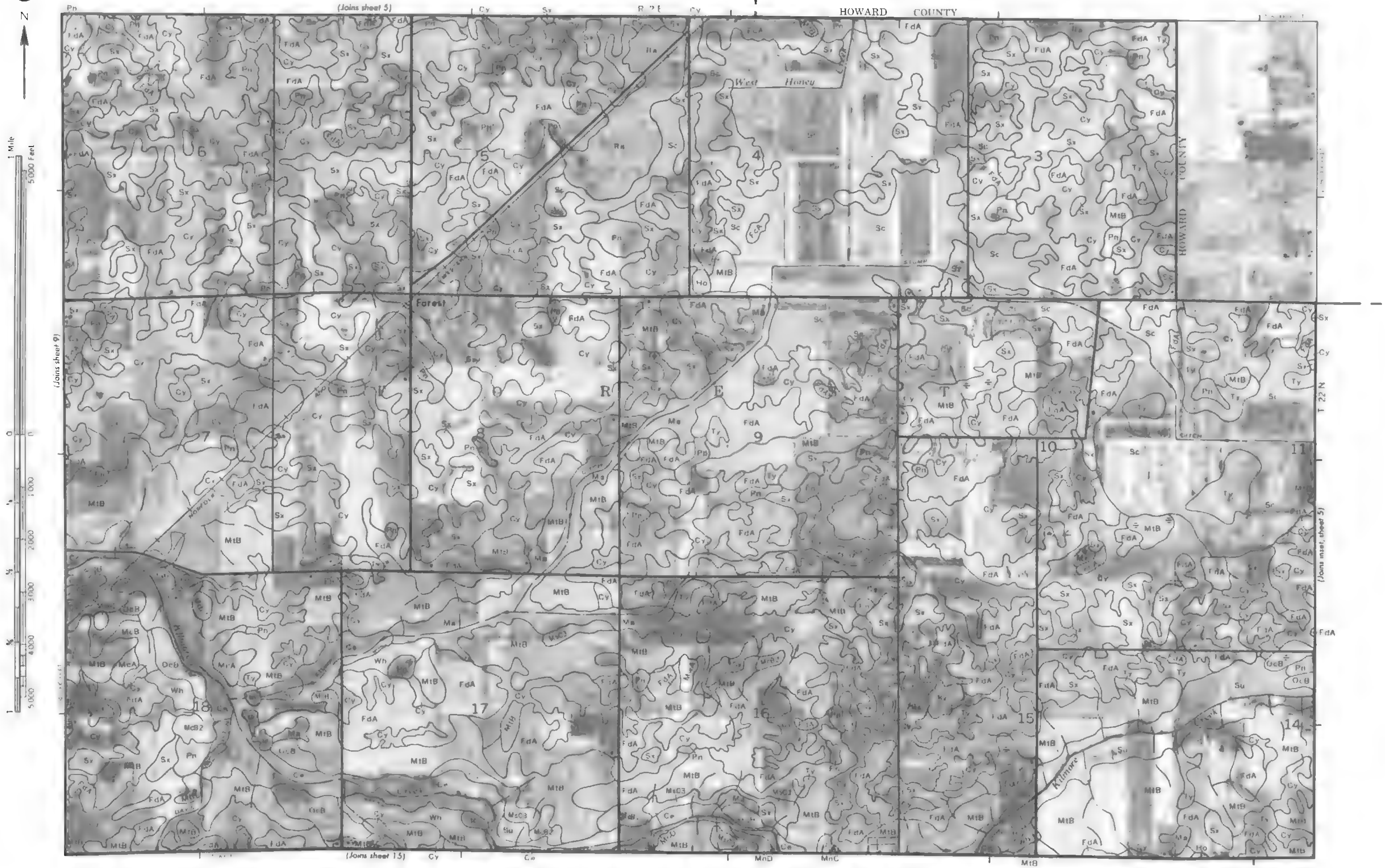
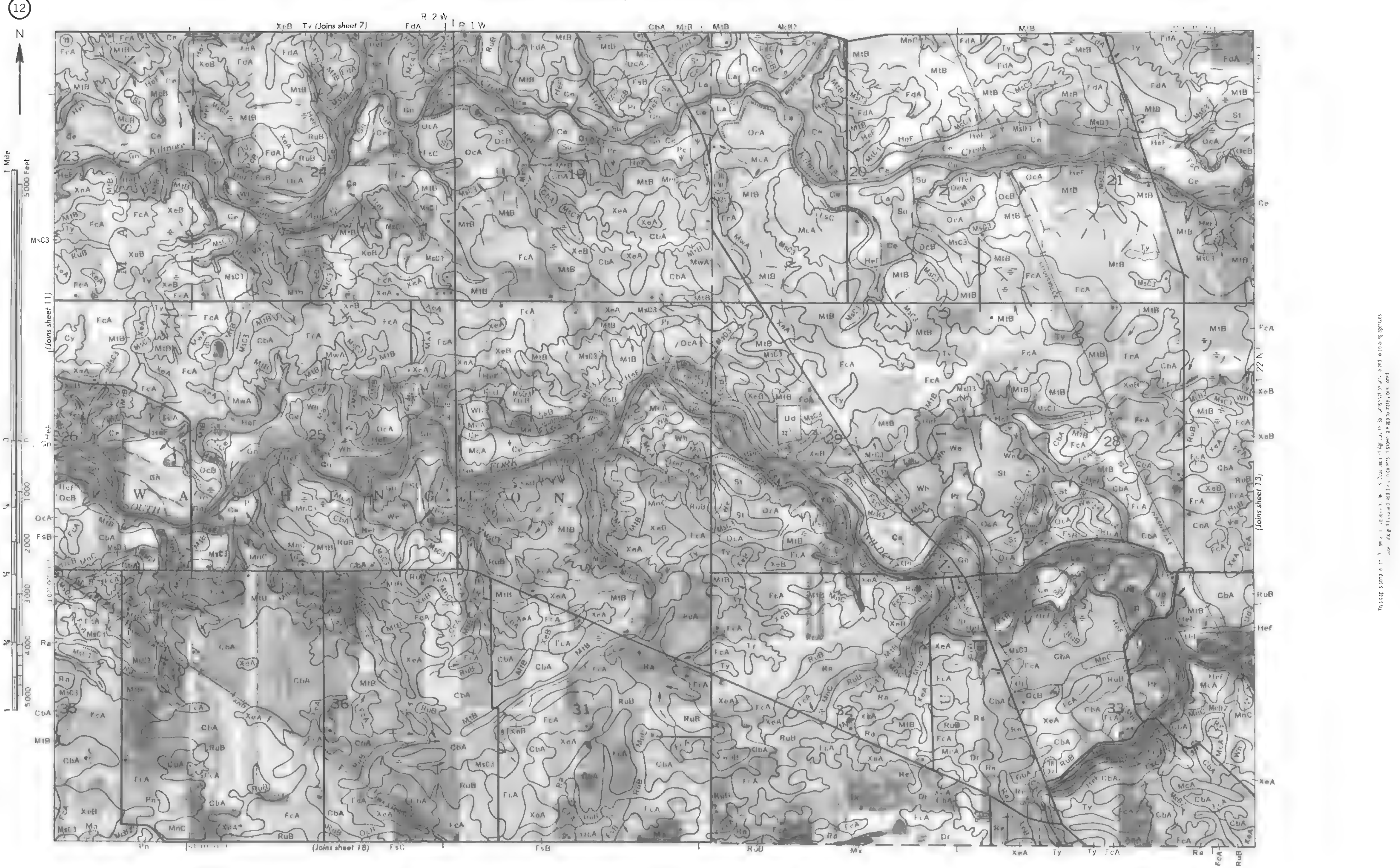
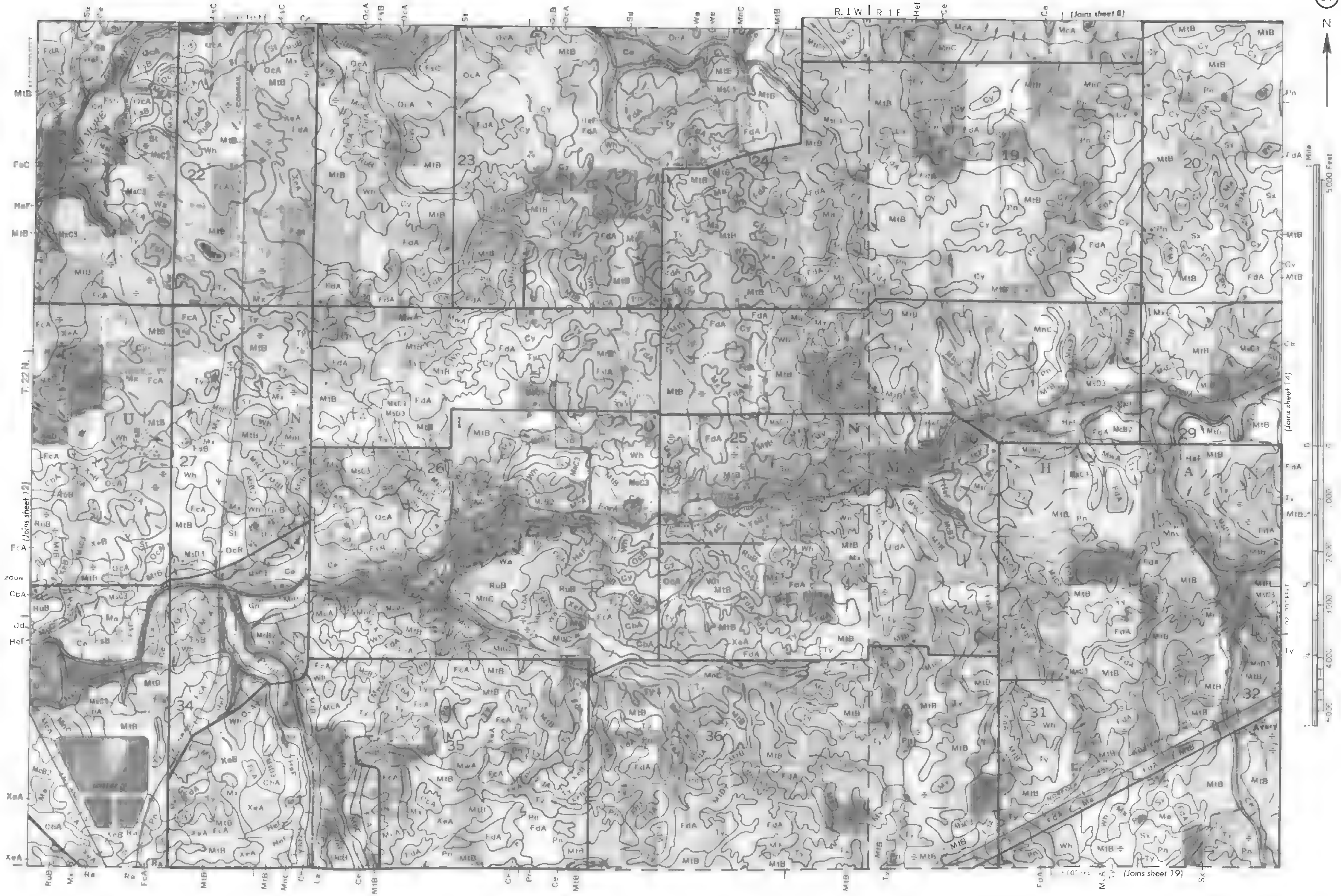

9
N
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 14)
(Joins sheet 8)
1 Mile
5 000 Feet
W A R R E N


N
1 Mile
5000 Feet
(Joins sheet 5)
R. 2 E.
HOWARD COUNTY
HOWARD COUNTY
West Honey
Forest
F O R E S T
(Joins sheet 9)
(Joins inset, sheet 5)
(Joins sheet 13)
T. 22 N.
Kilmore
Kilmore
1
2
3
4
5
6
7
8
9
10
11
14
15
16
17
18


11
N
(Joins sheet 6)
(Joins sheet 12)
(Joins sheet 17)
R. 2 W.
MULBERRY
TIPPECANOE COUNTY
1 Mile
5000 Feet
19
20
21
22
27
28
29
30
31
32
33
34


12
N
R 2 W
R 1 W
(Joins sheet 7)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 18)
T 22 N
1 Mile
5000 Feet
Kilmore
Creek
WASHINGTON
CLINTON COUNTY, INDIANA NO. 12



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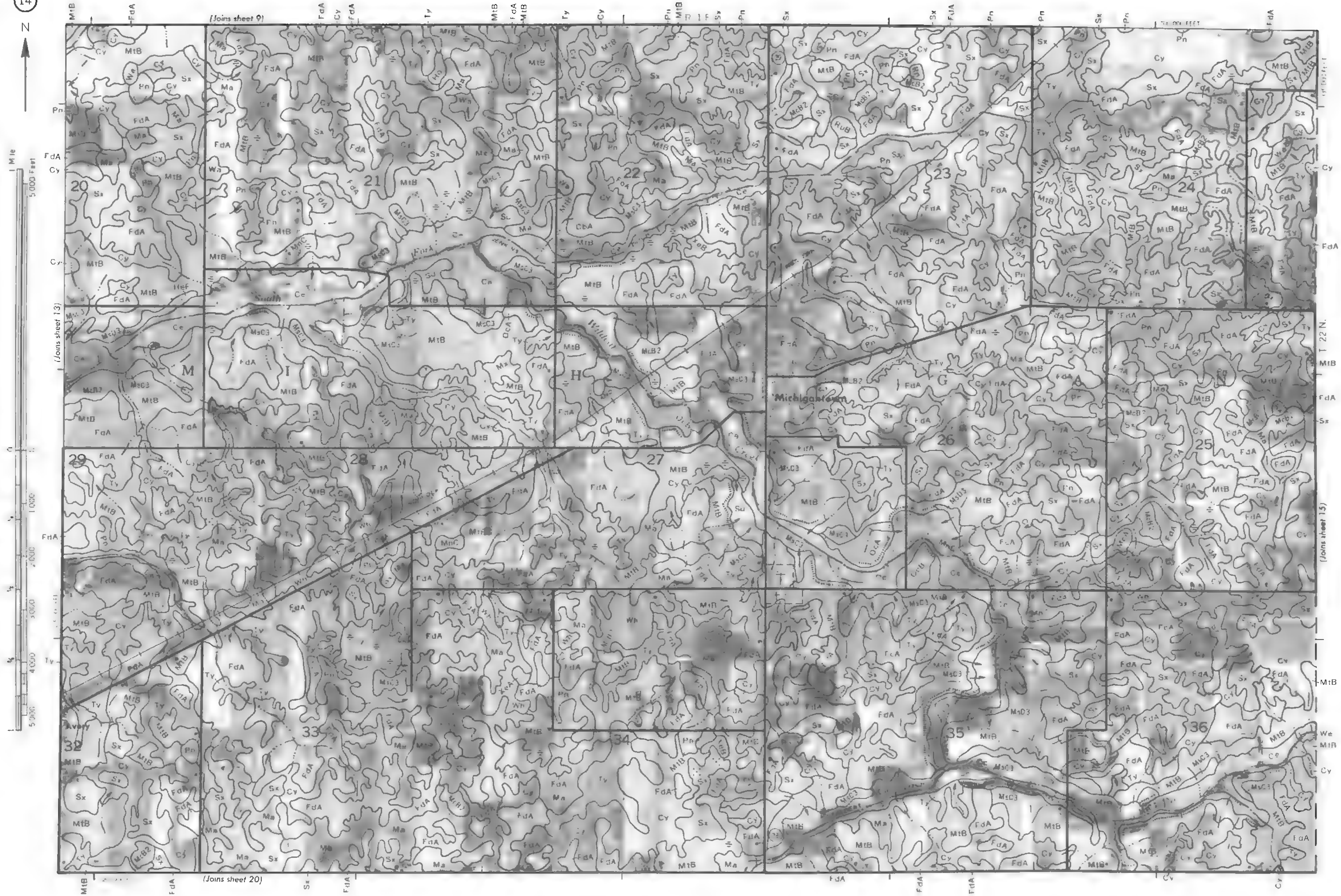
(14)

CLINTON COUNTY, INDIANA — SHEET NUMBER 14



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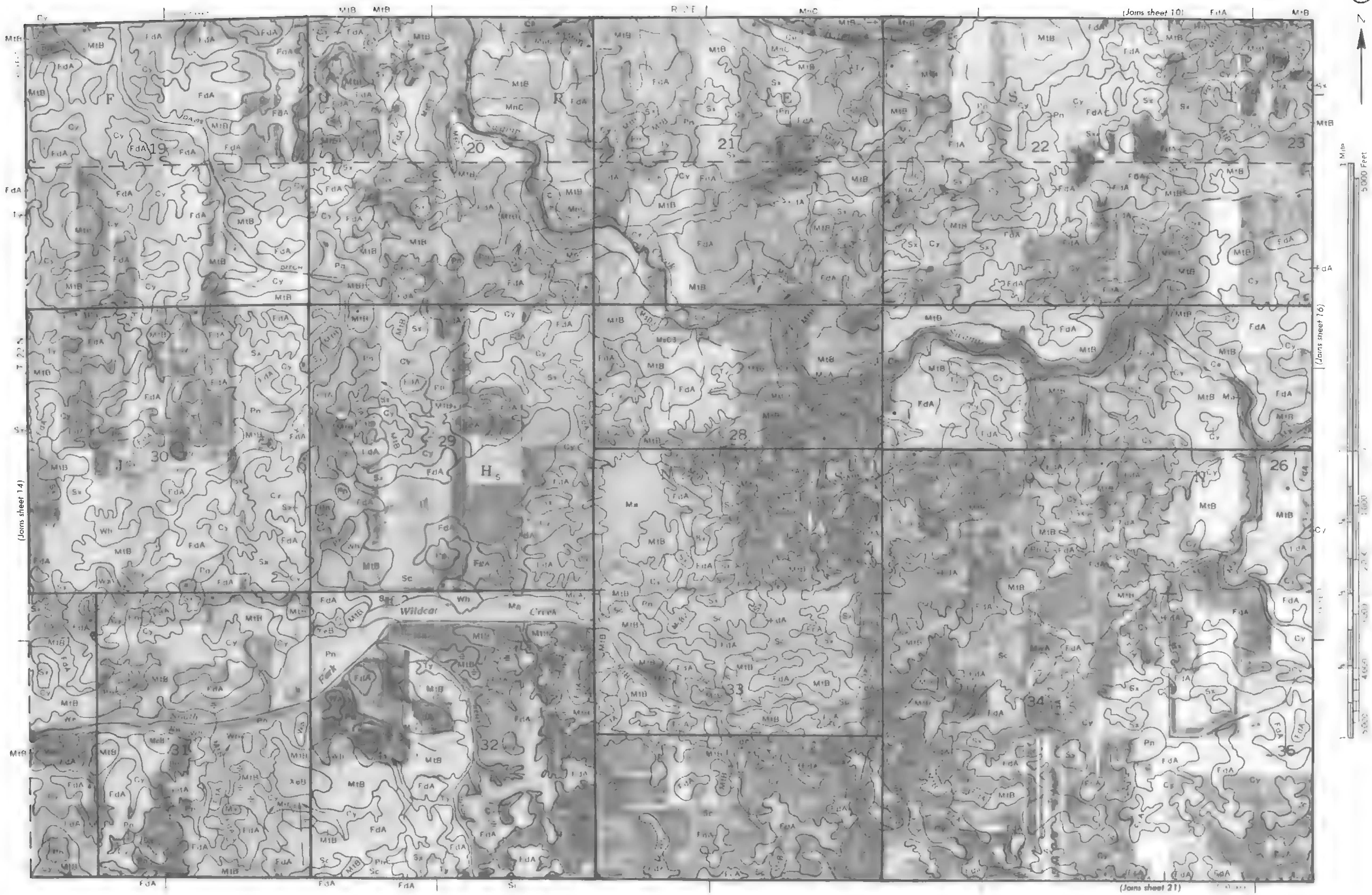
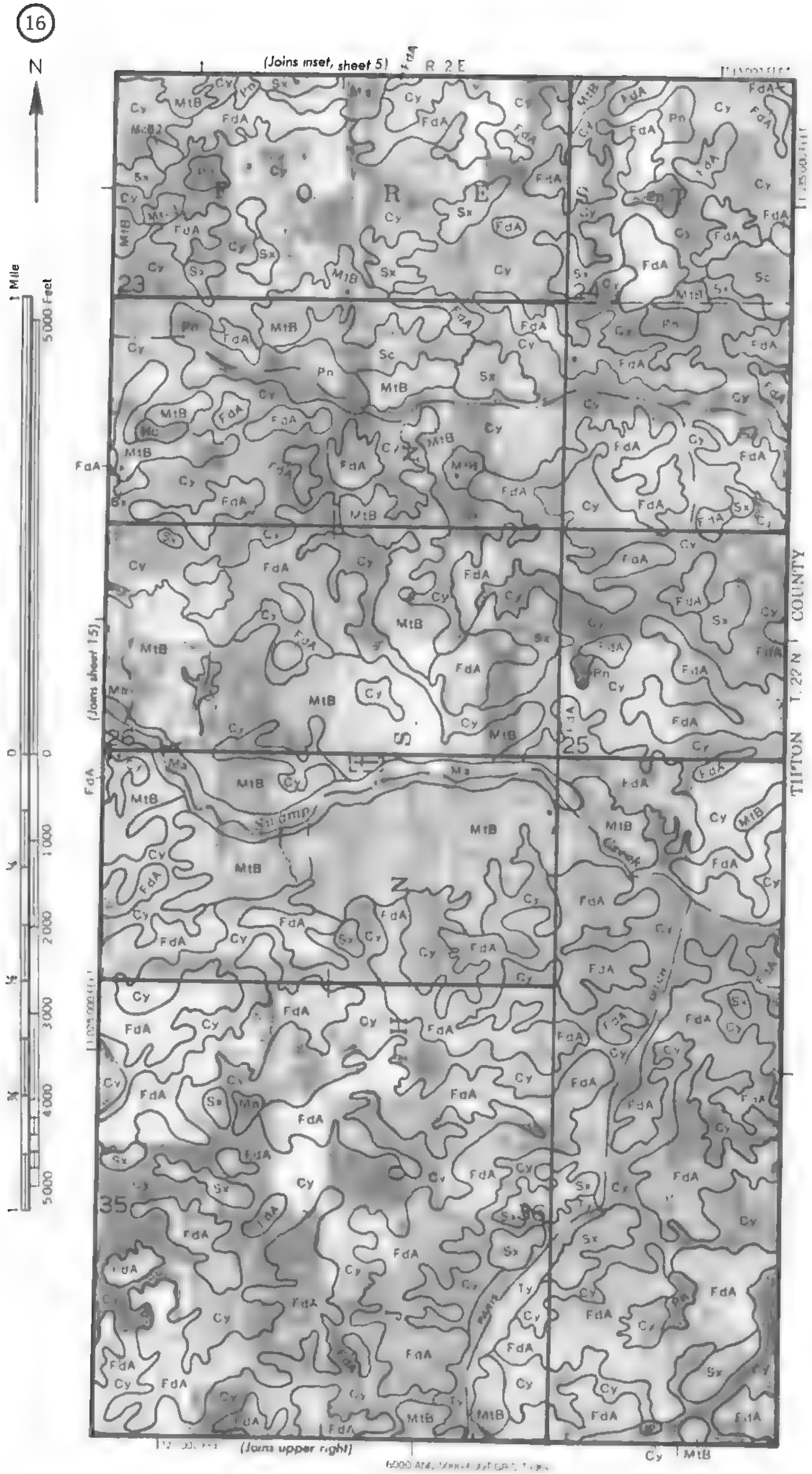
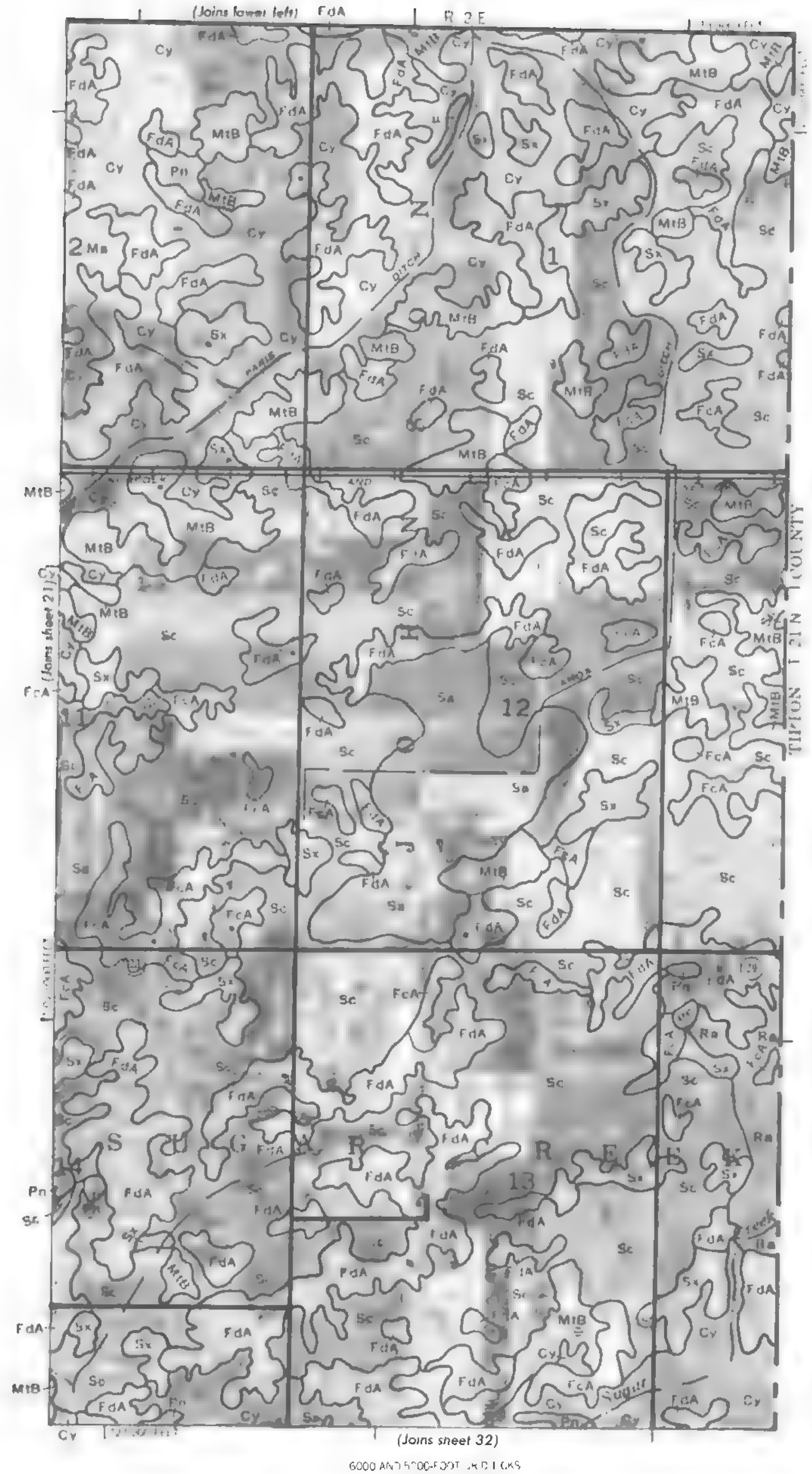
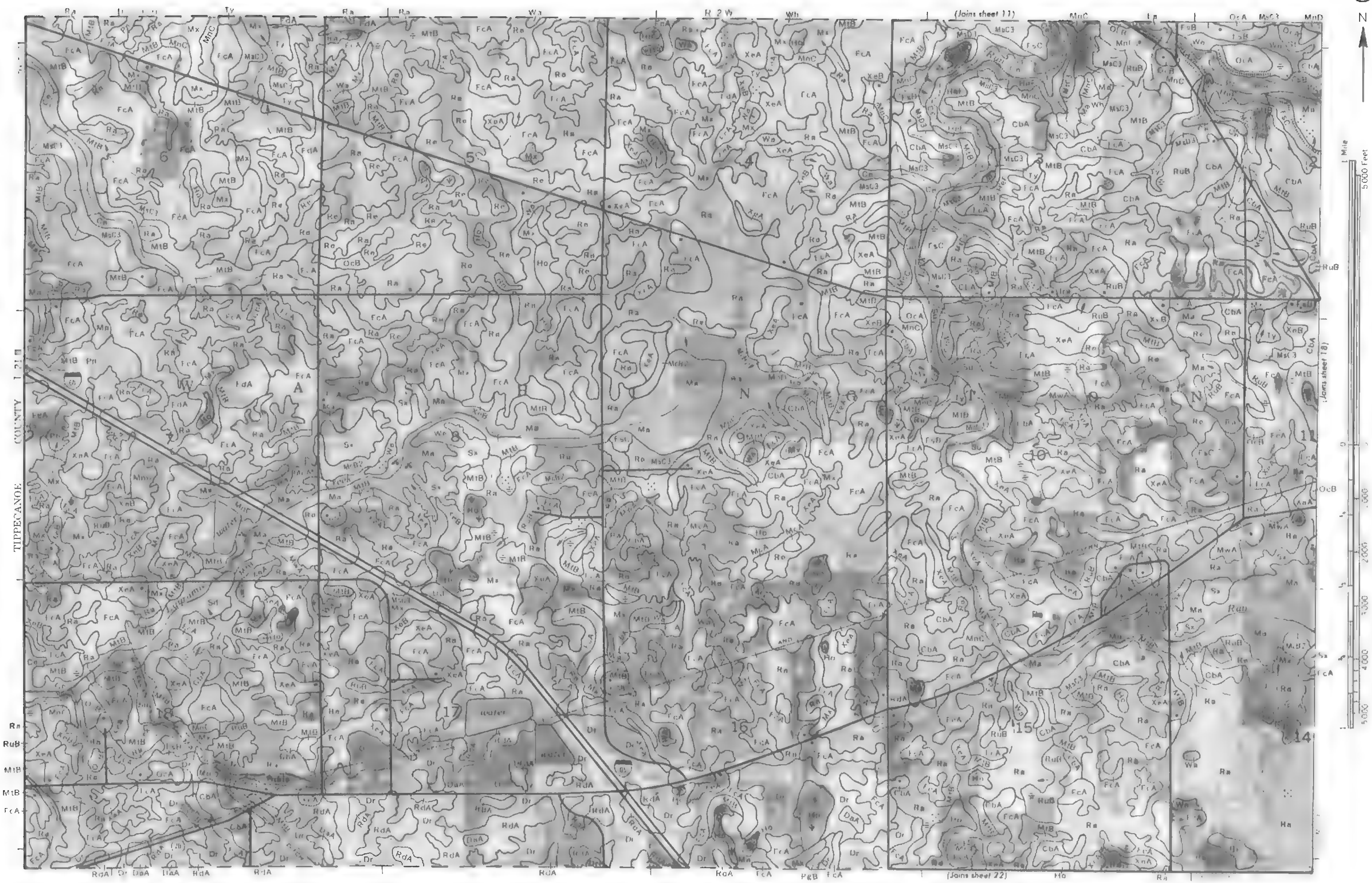

15
N
(Joins sheet 10)
(Joins sheet 16)
(Joins sheet 14)
(Joins sheet 21)
1 Mile
5000 Feet
19
20
21
22
23
26
28
29
30
31
32
33
34
35
Wildcat
Creek
Fork
South
FdA
MtB
Cy
Sx
Pn
MnC

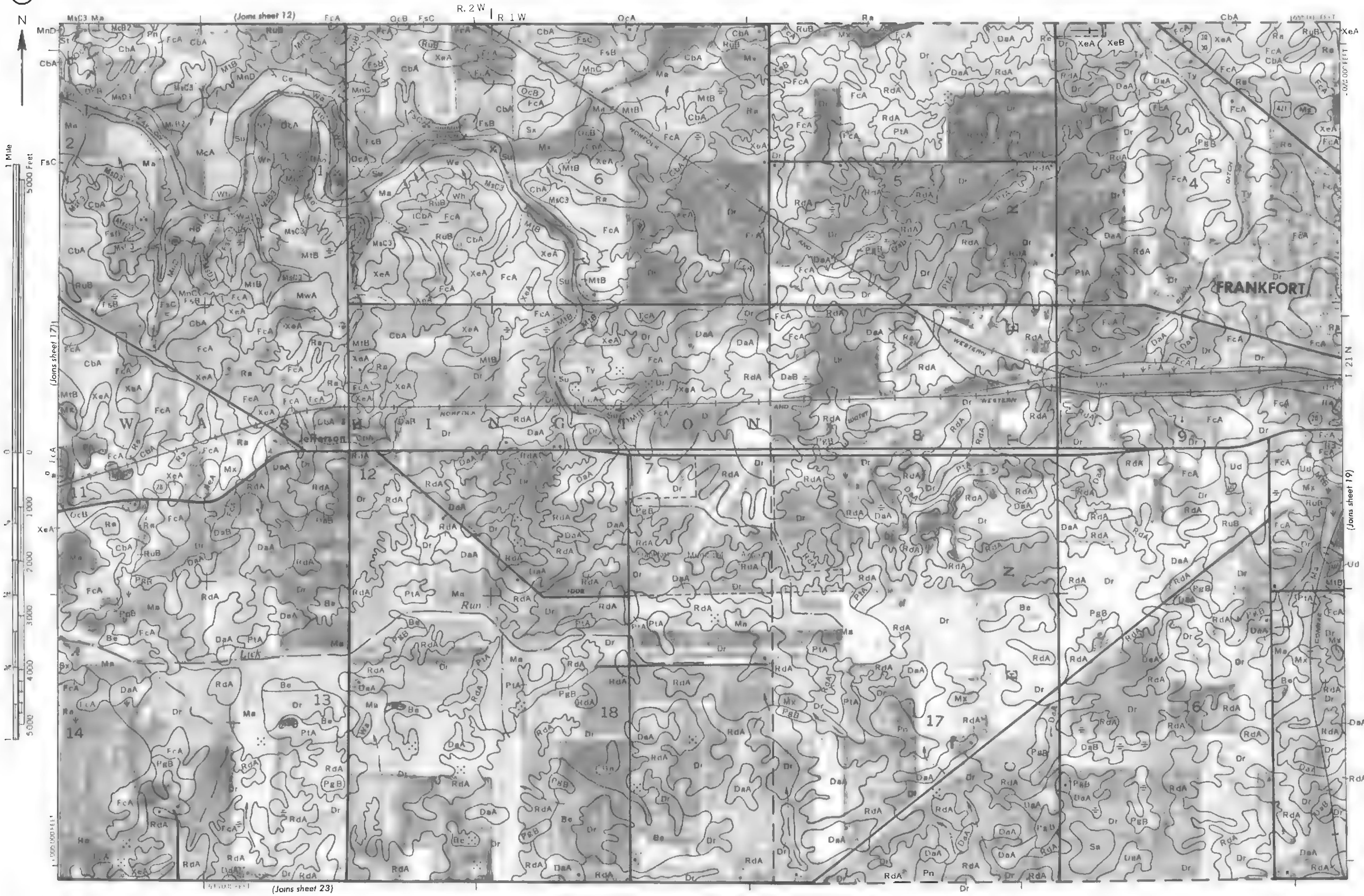


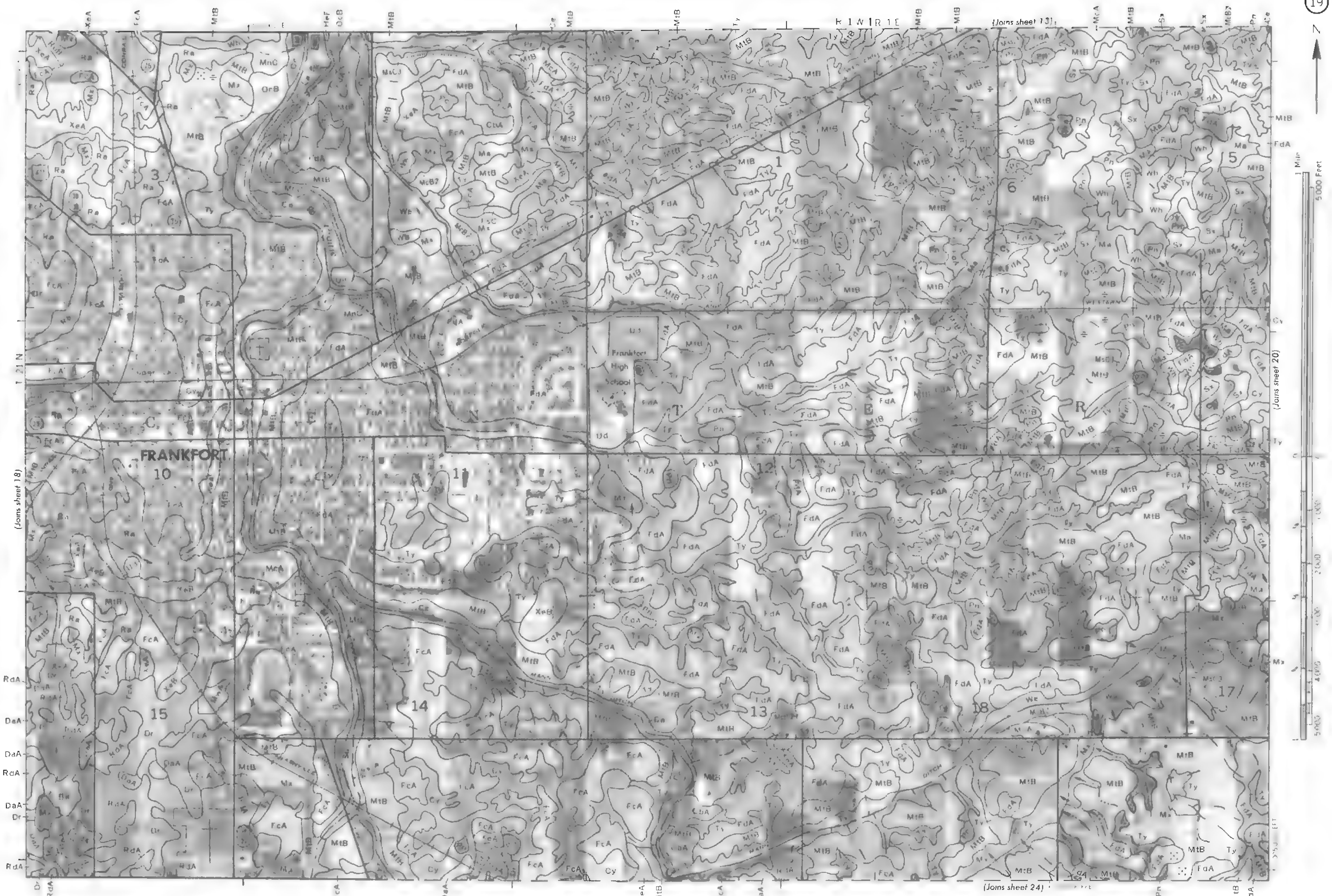


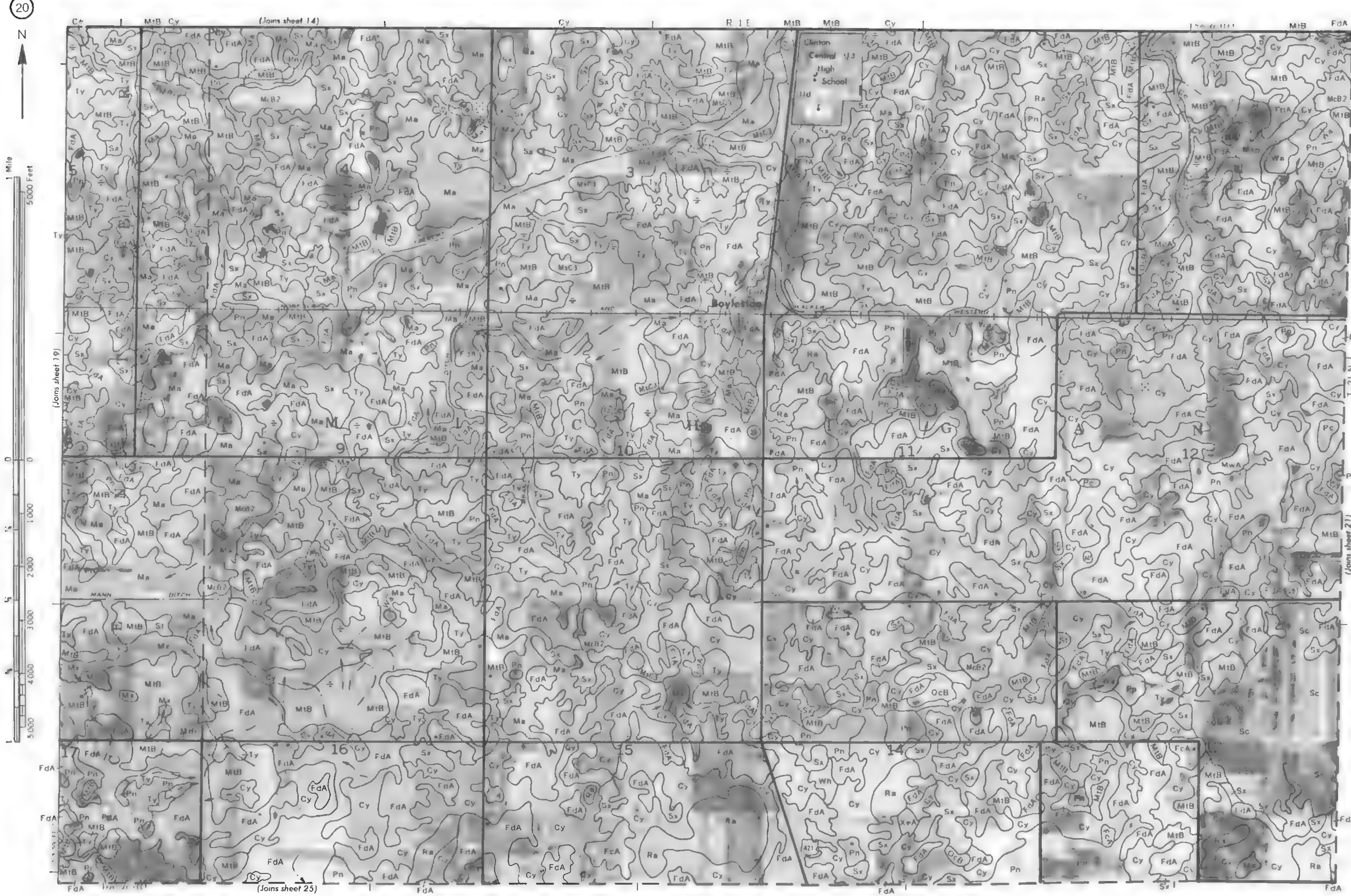
CLINTON COUNTY, INDIANA NO. 16

17


(Joins sheet 11)
(Joins sheet 22)
(Joins sheet 18)
TIPPECANOE COUNTY
R. 2 W.
N
1 Mile
5000 Feet

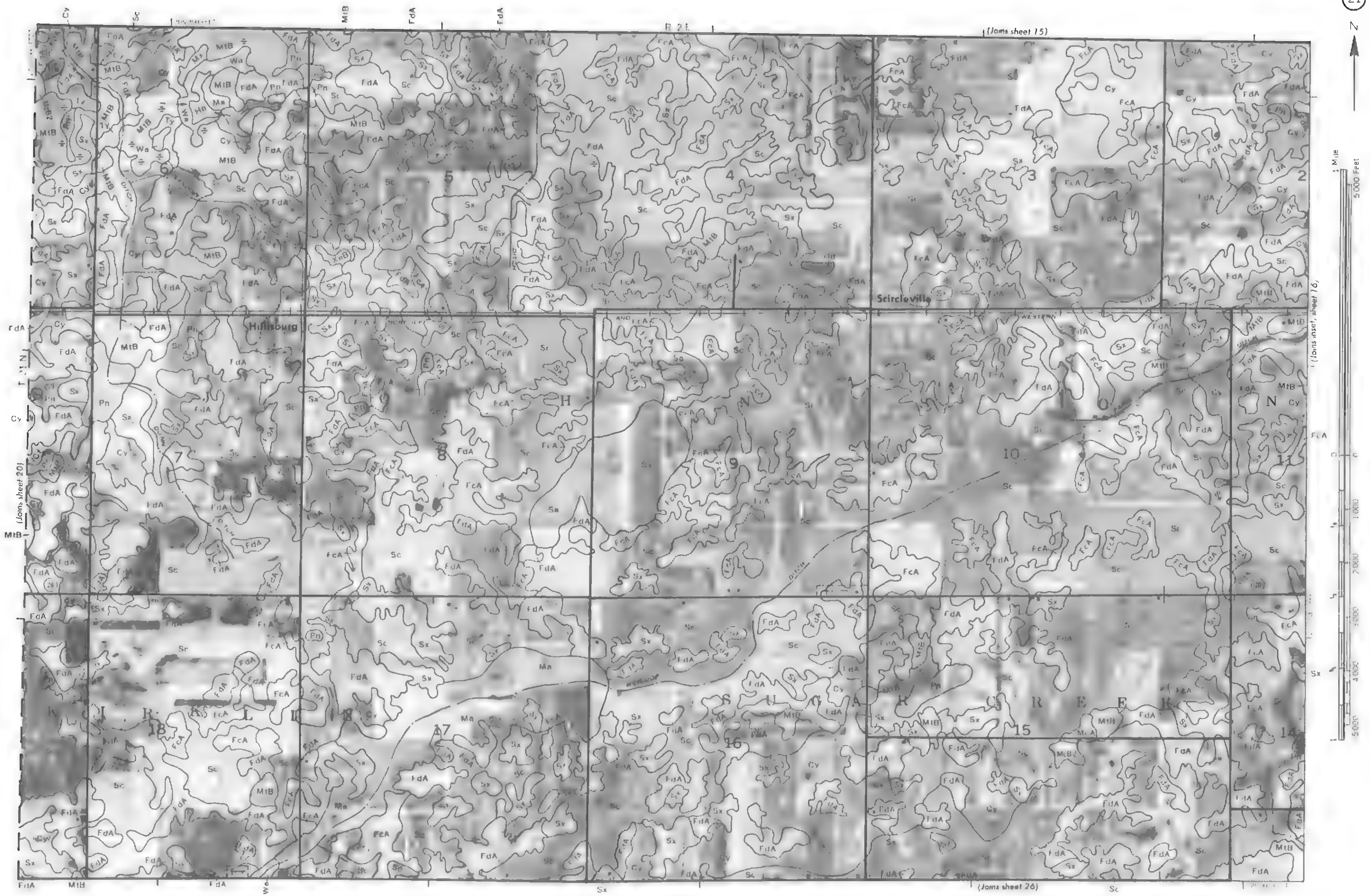

18
N
1 Mile
5000 Feet
(Joins sheet 12)
R. 2 W
R. 1 W
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 23)
T. 21 N
FRANKFORT
Jefferson
W A S H I N G T O N
Lick
Run
NORFOLK AND WESTERN

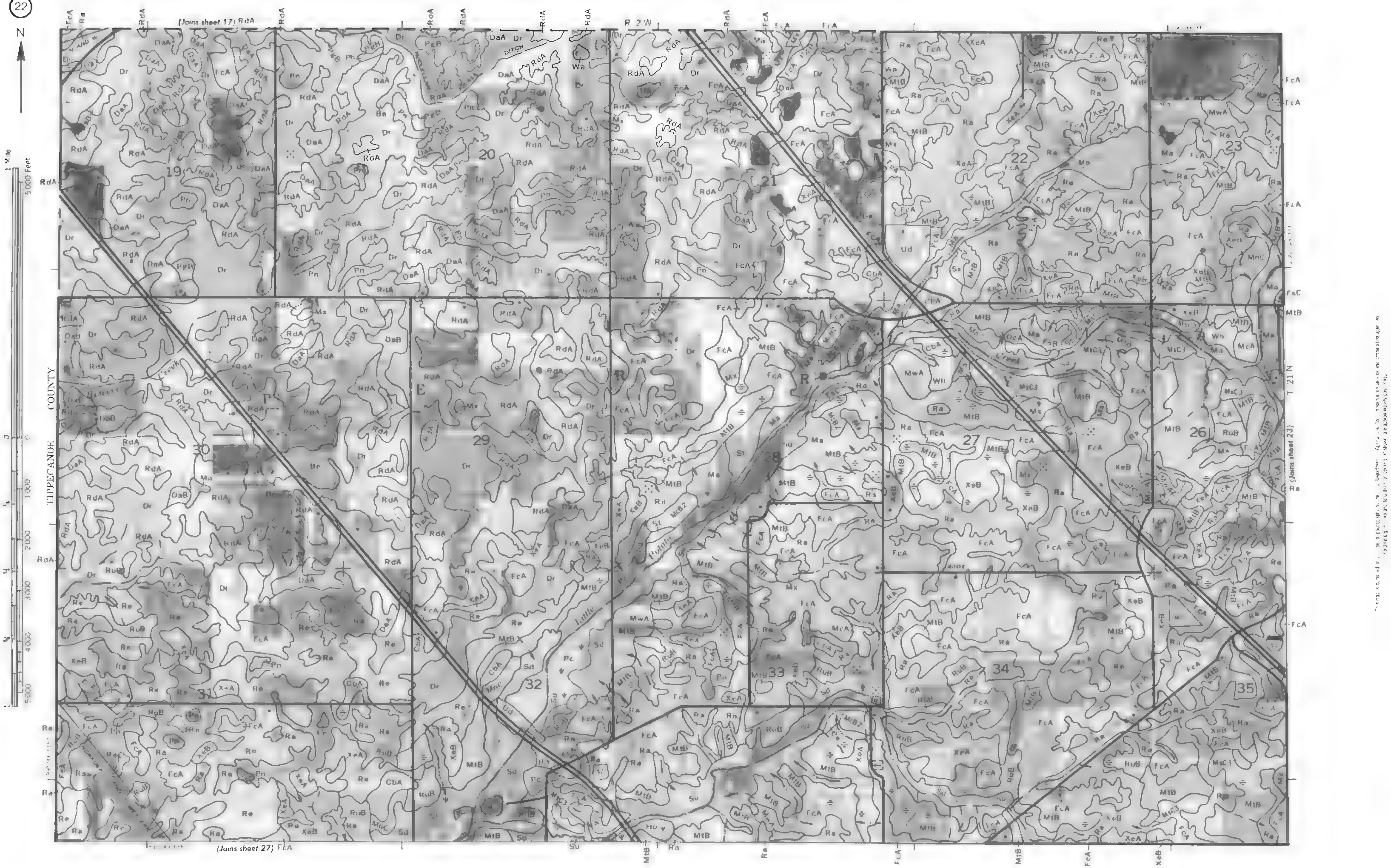

R 1 W | R 1 E
(Joins sheet 13)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
T 21 N
FRANKFORT
Frankfort High School
1 Mile
5000 Feet



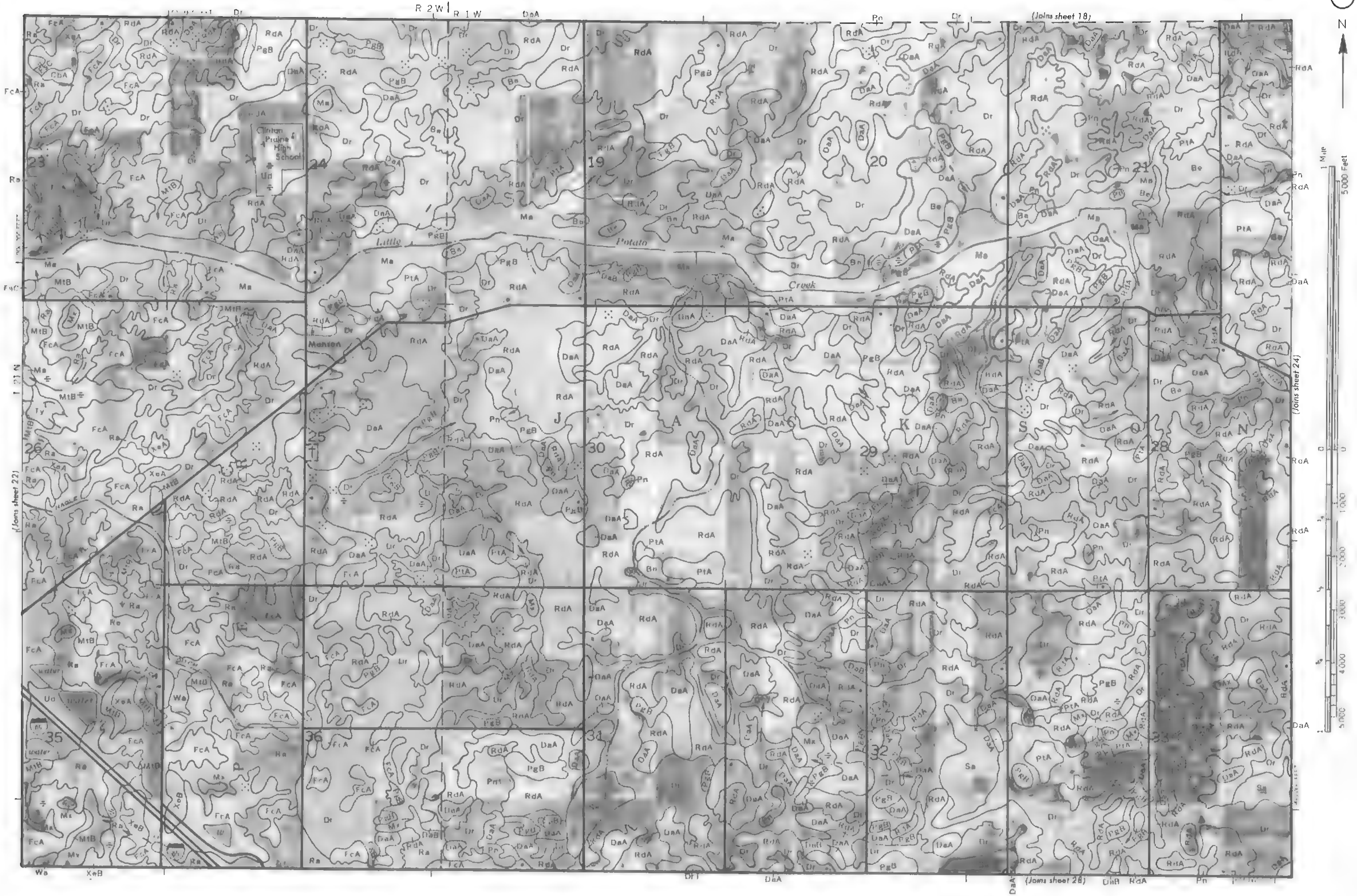
This map is compiled on [illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLINTON COUNTY, INDIANA NO. 20


(Joins sheet 15)
(Joins sheet 20)
(Joins inset, sheet 16)
(Joins sheet 26)
Hillisburg
Scircleville
S U G A R C R E E K
N
1 Mile
5000 Feet



CLINTON COUNTY, INDIANA — SHEET NUMBER 23



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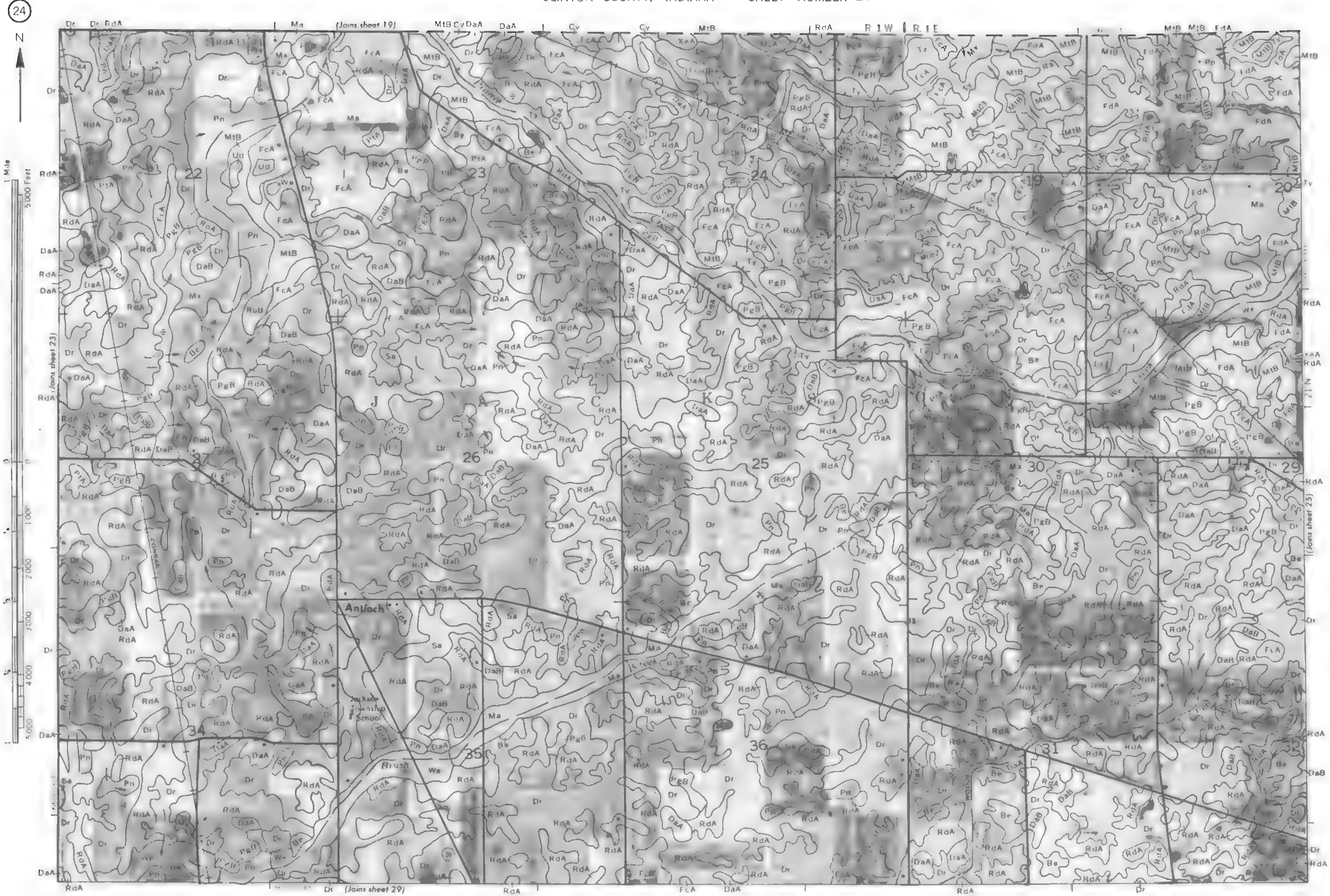
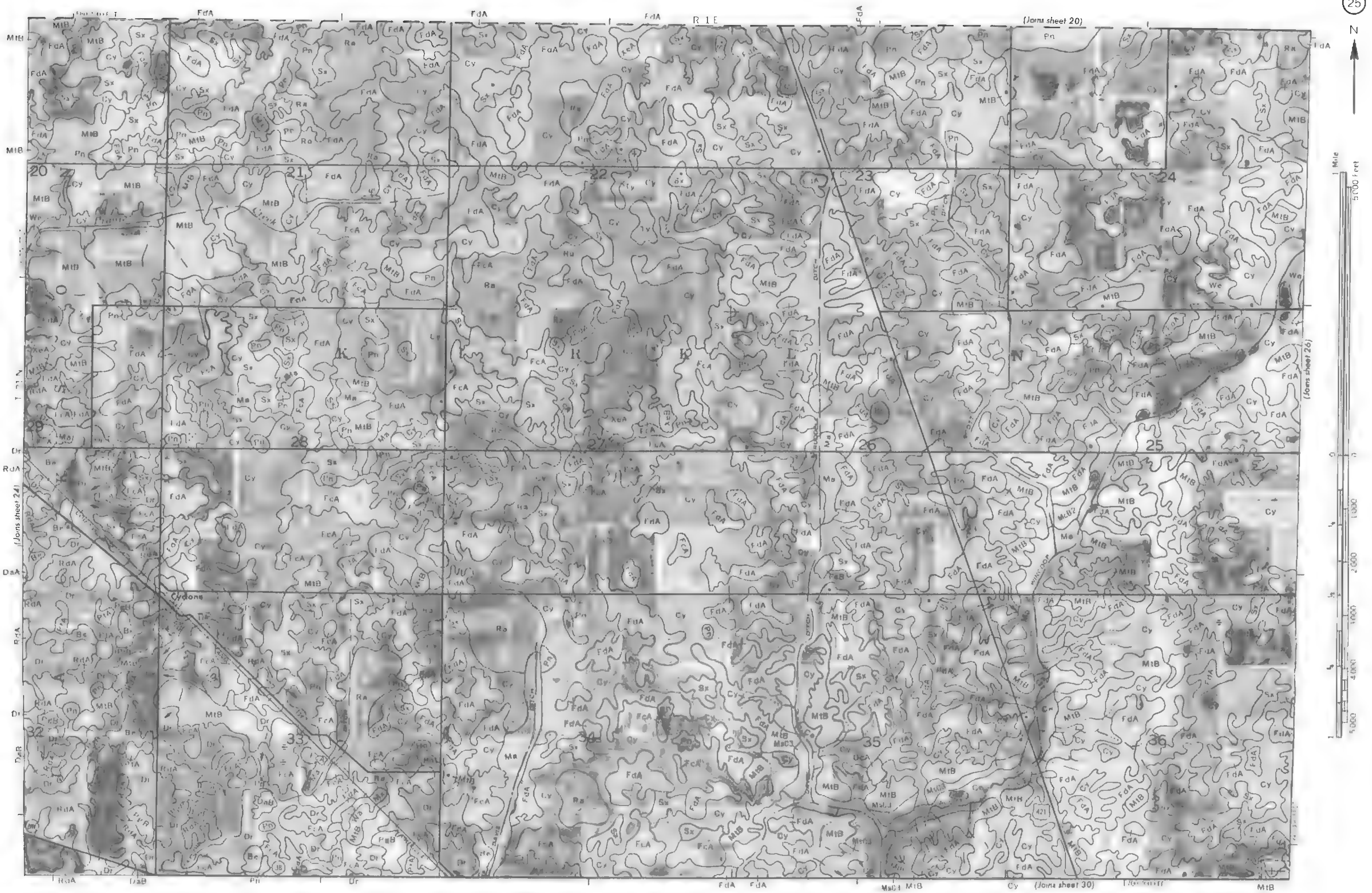


CLINTON COUNTY, INDIANA NO. 24


25
N
(Joins sheet 20)
(Joins sheet 26)
(Joins sheet 30)
(Joins sheet 24)
R 1 E
T 21 N
Cyclone
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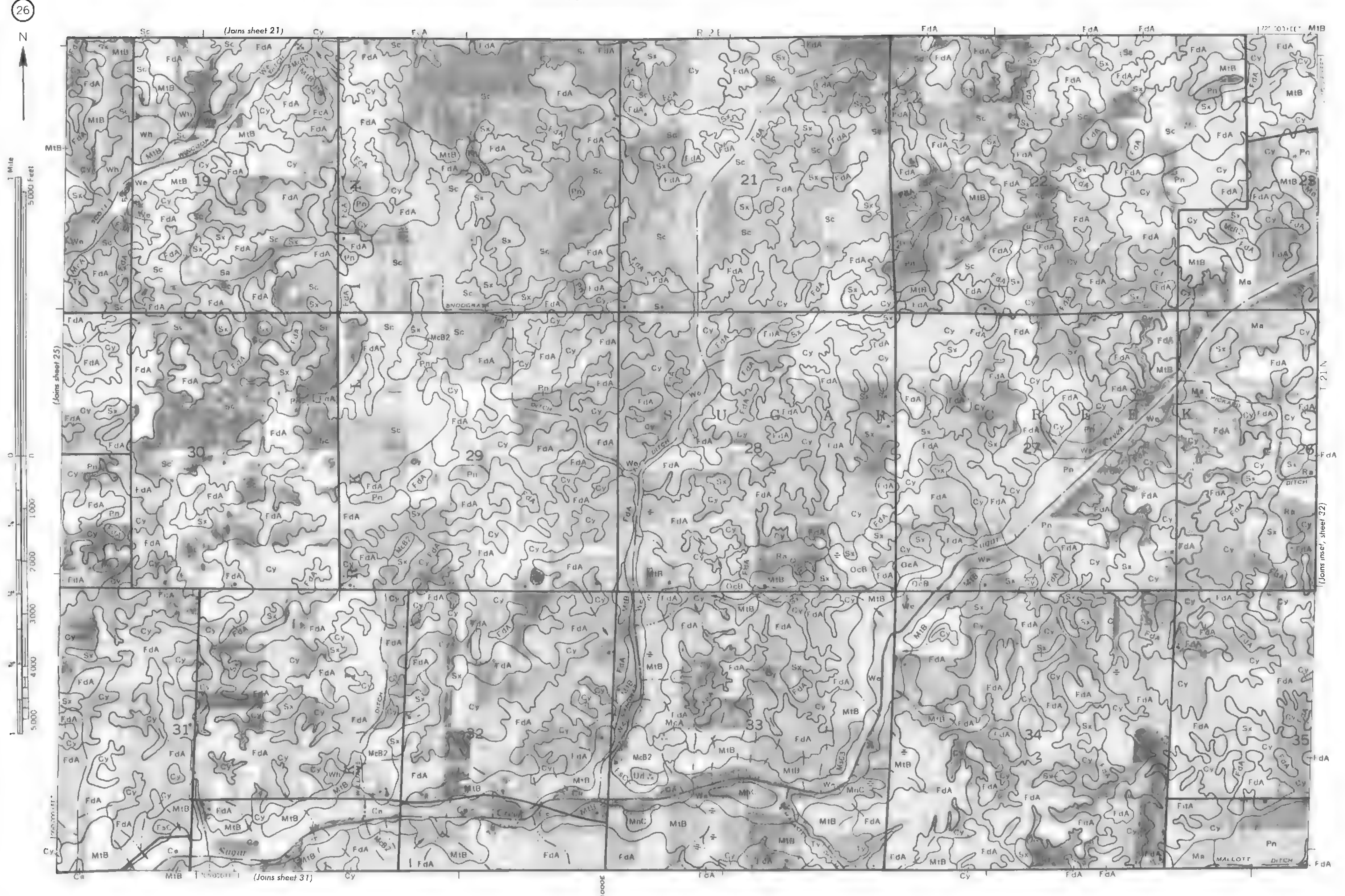
21
22
23
24
25
26
27
28
29
32
33
34
35
36
1 Mile
5000 Feet



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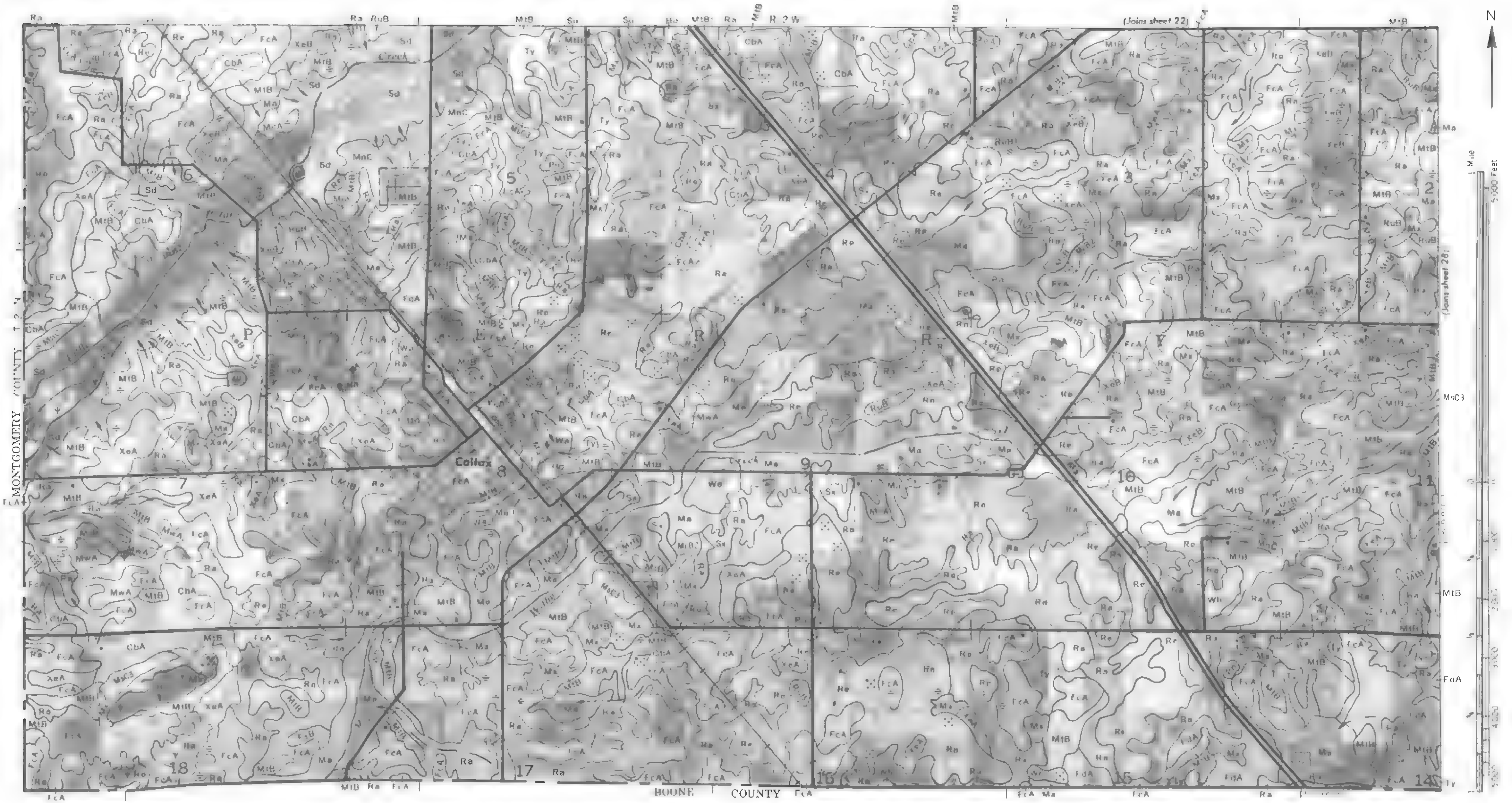

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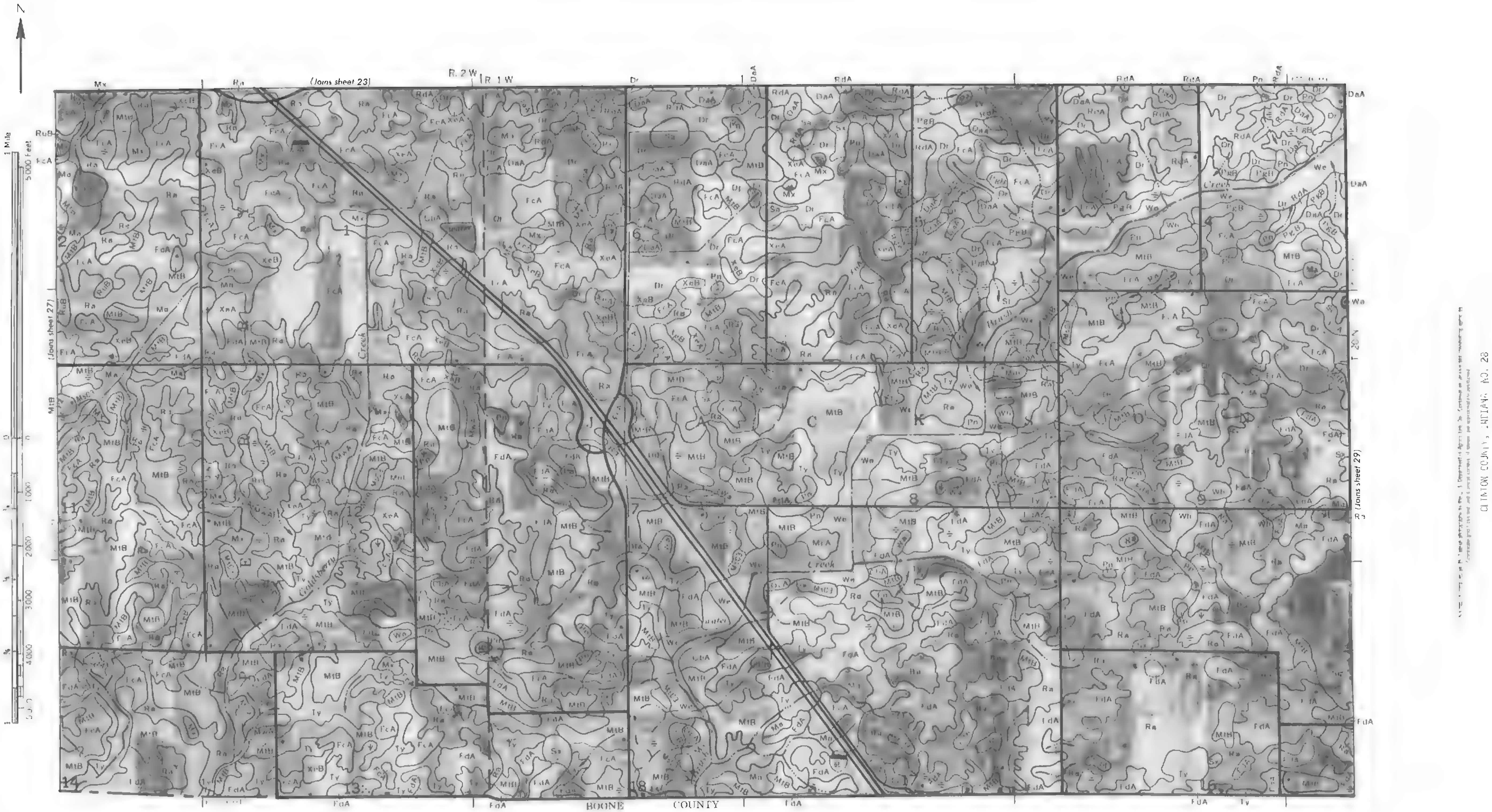
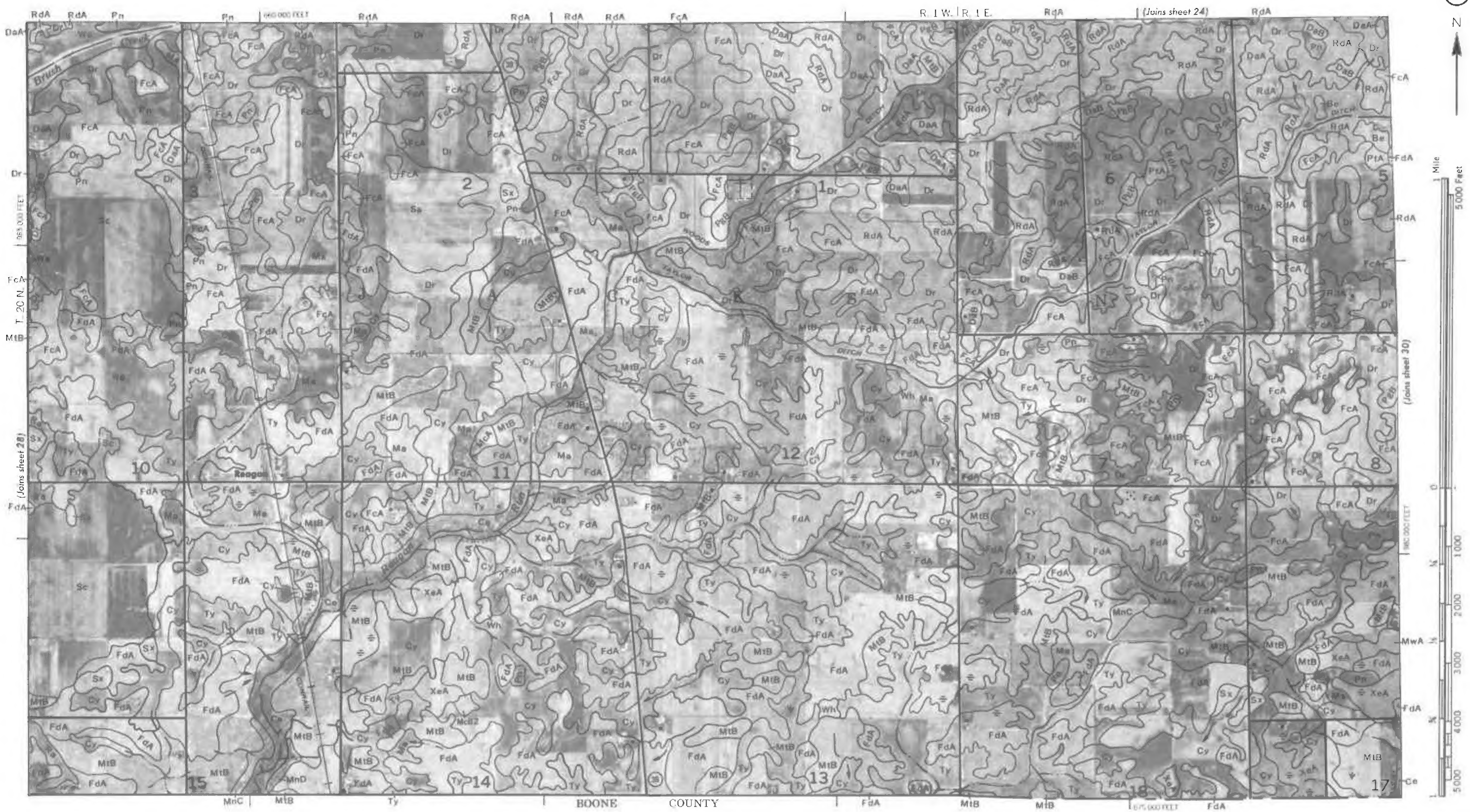
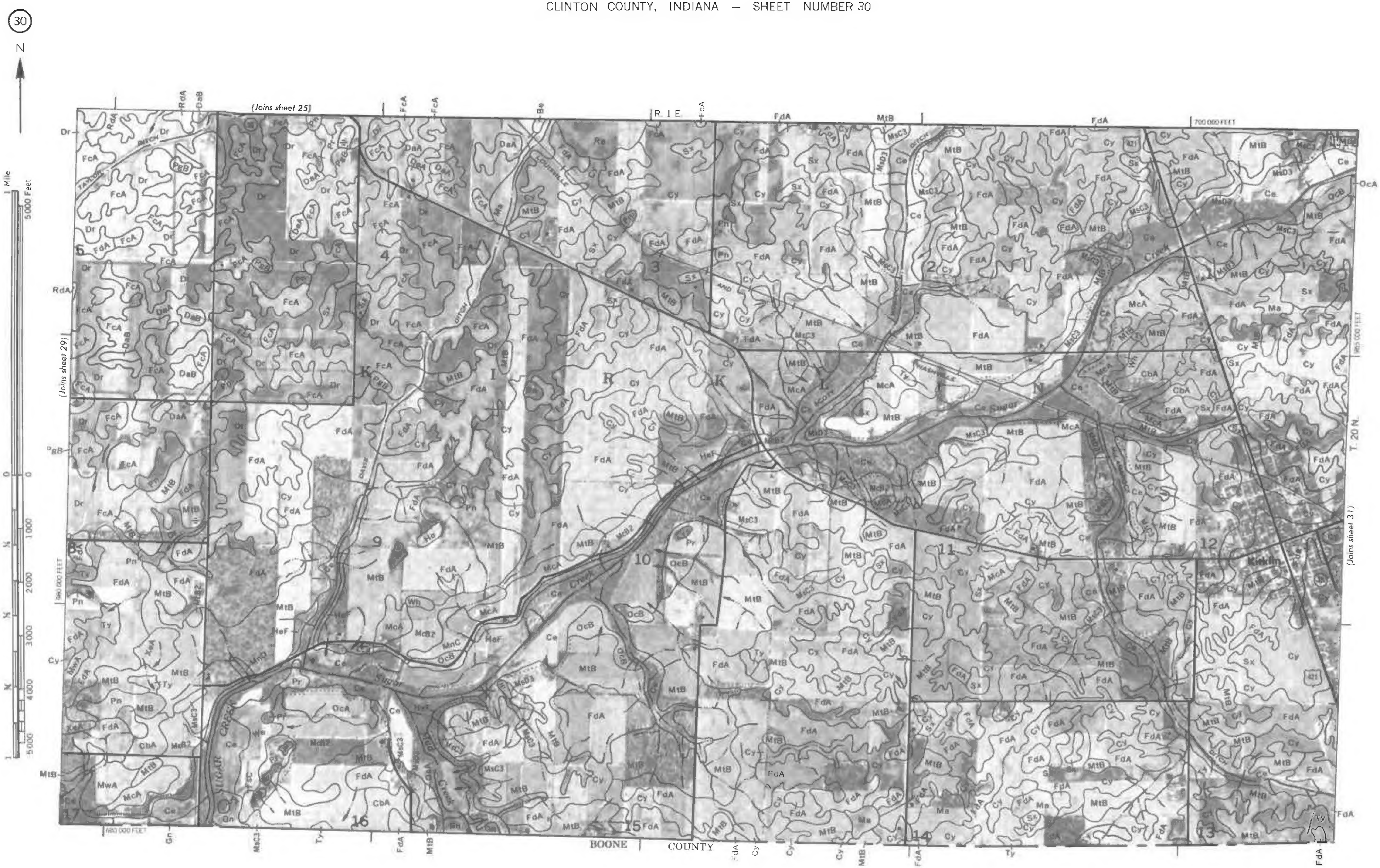

28
N
1 Mile
5000 Feet
(Joins sheet 23)
R. 2 W. | R. 1 W.
(Joins sheet 27)
(Joins sheet 29)
T. 20 N.
BOONE COUNTY
Creek


(Joins sheet 24)
(Joins sheet 28)
(Joins sheet 30)
BOONE COUNTY
R. 1 W. | R. 1 E.
T. 20 N.
N
1 Mile
5000 Feet



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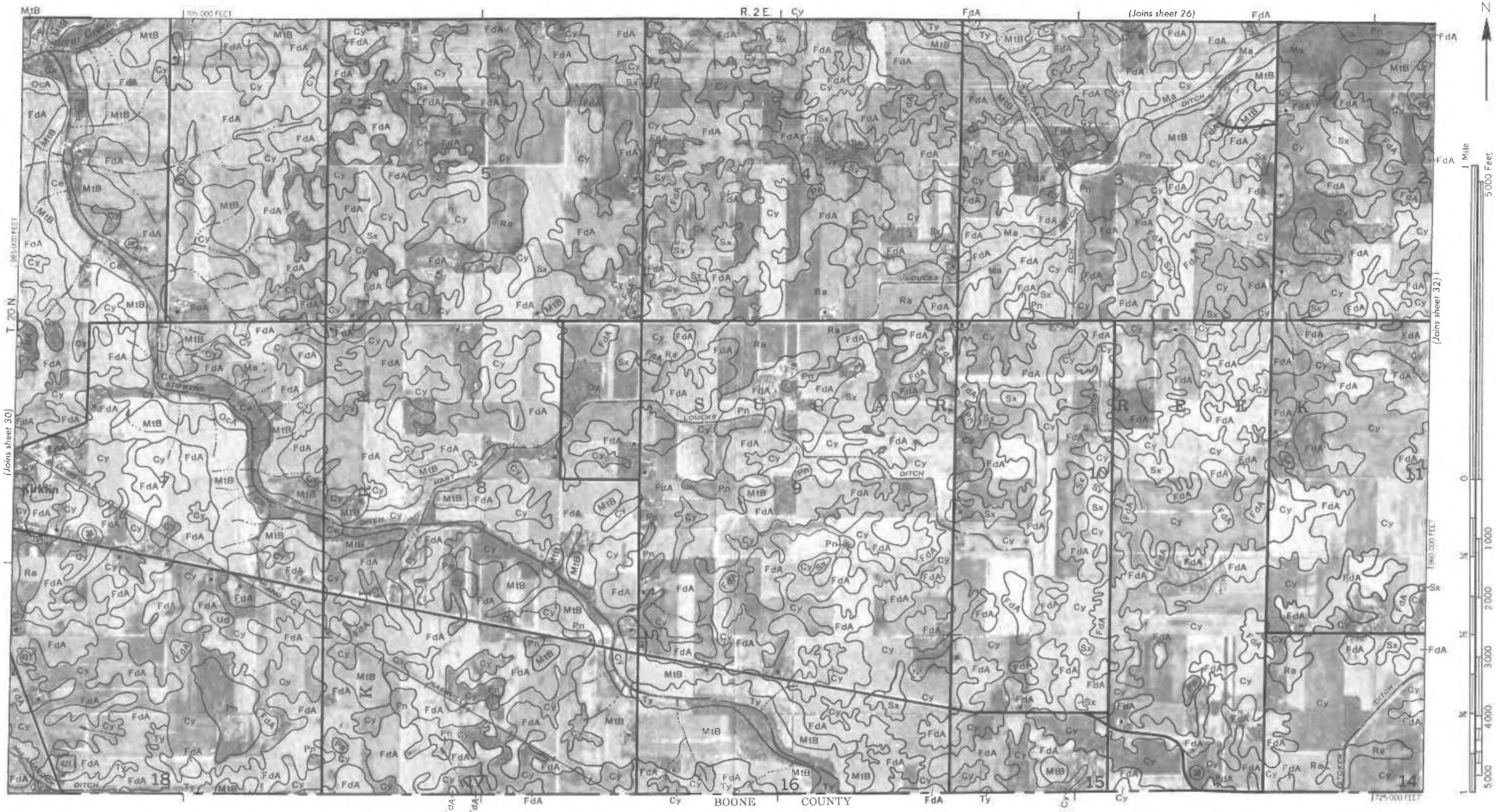
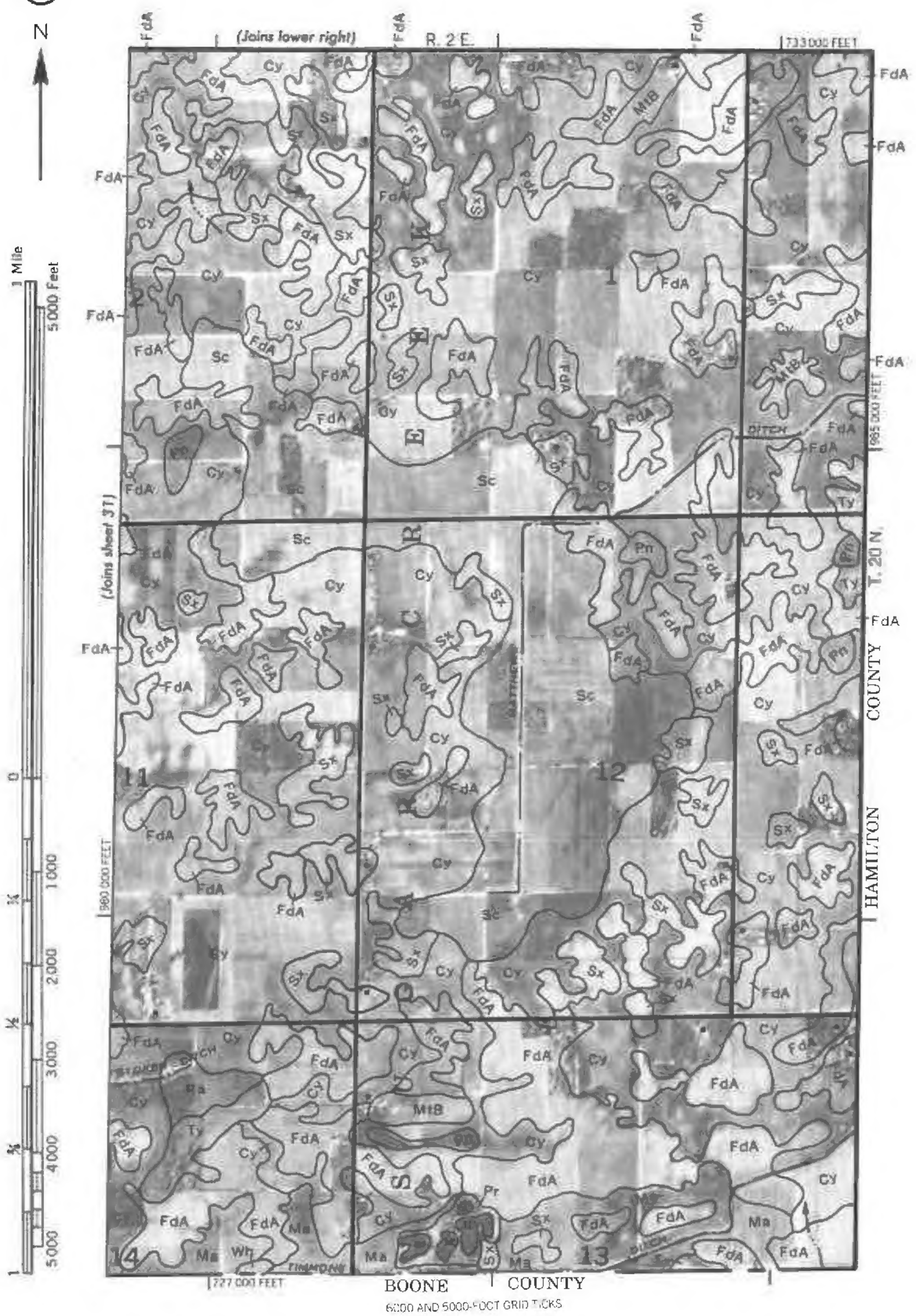
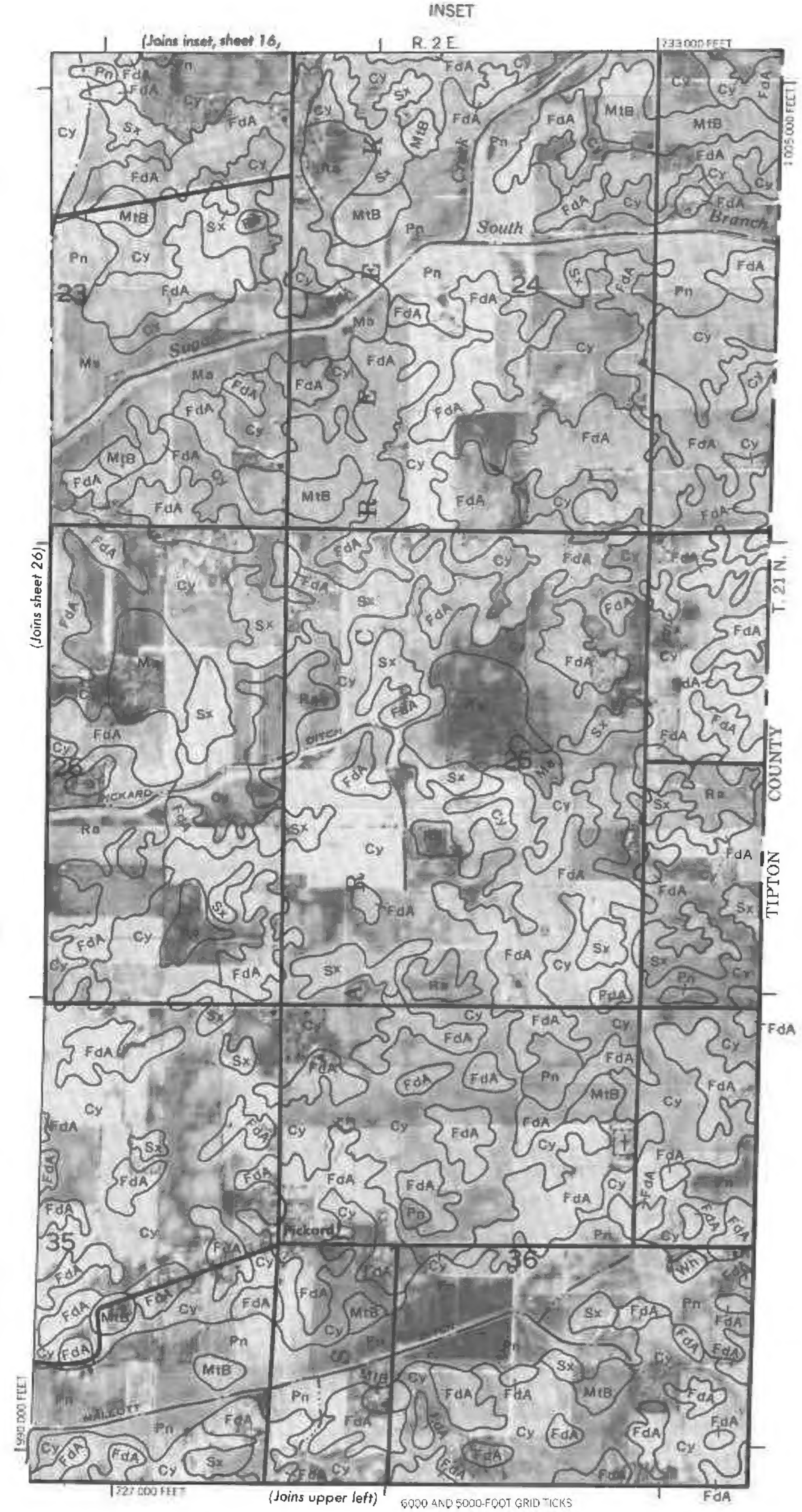
CLINTON COUNTY, INDIANA NO. 30



CLINTON COUNTY, INDIANA NO. 31

This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CLINTON COUNTY, INDIANA NO. 32